SCIENTIFIC AMERICAN

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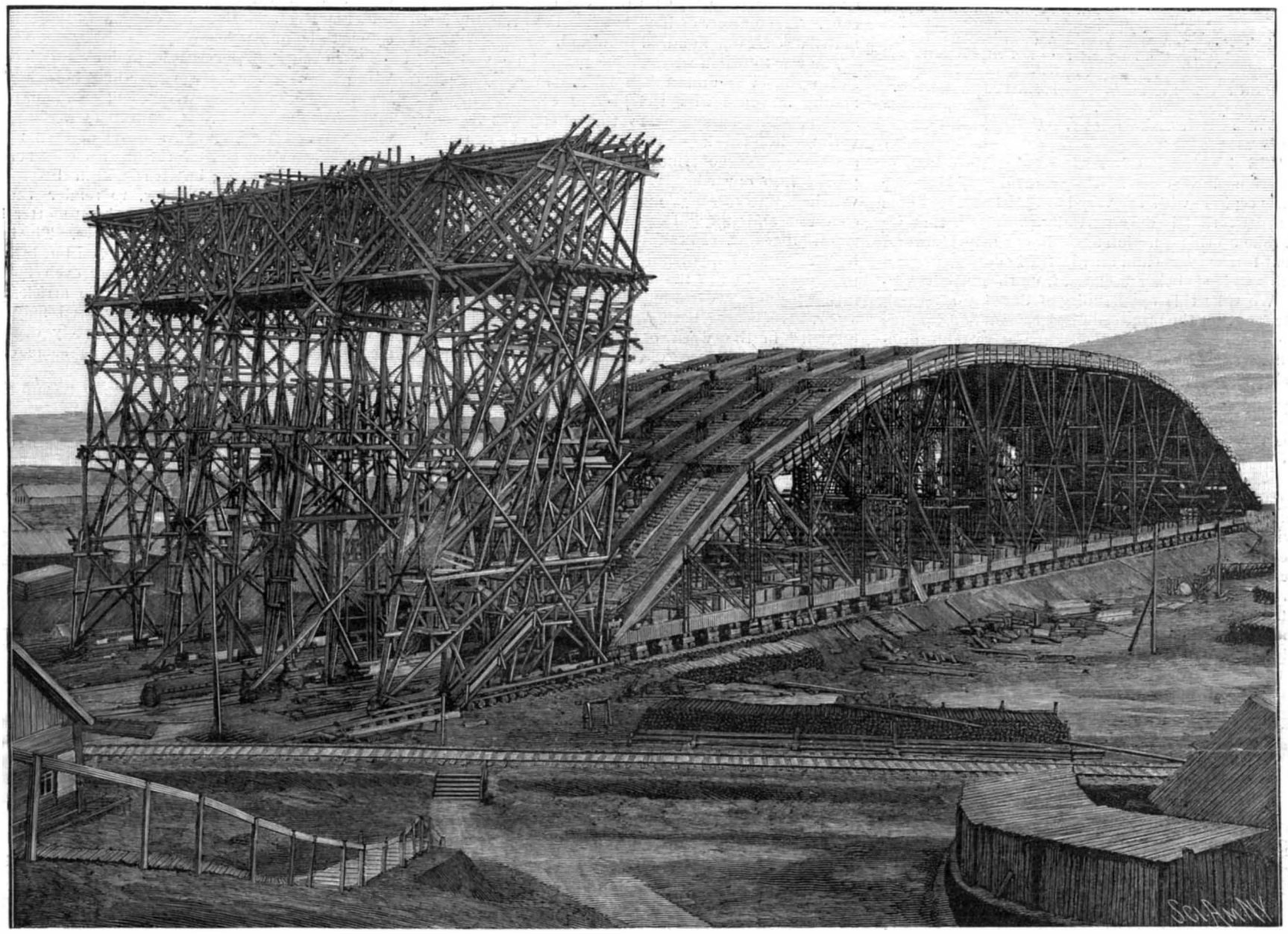
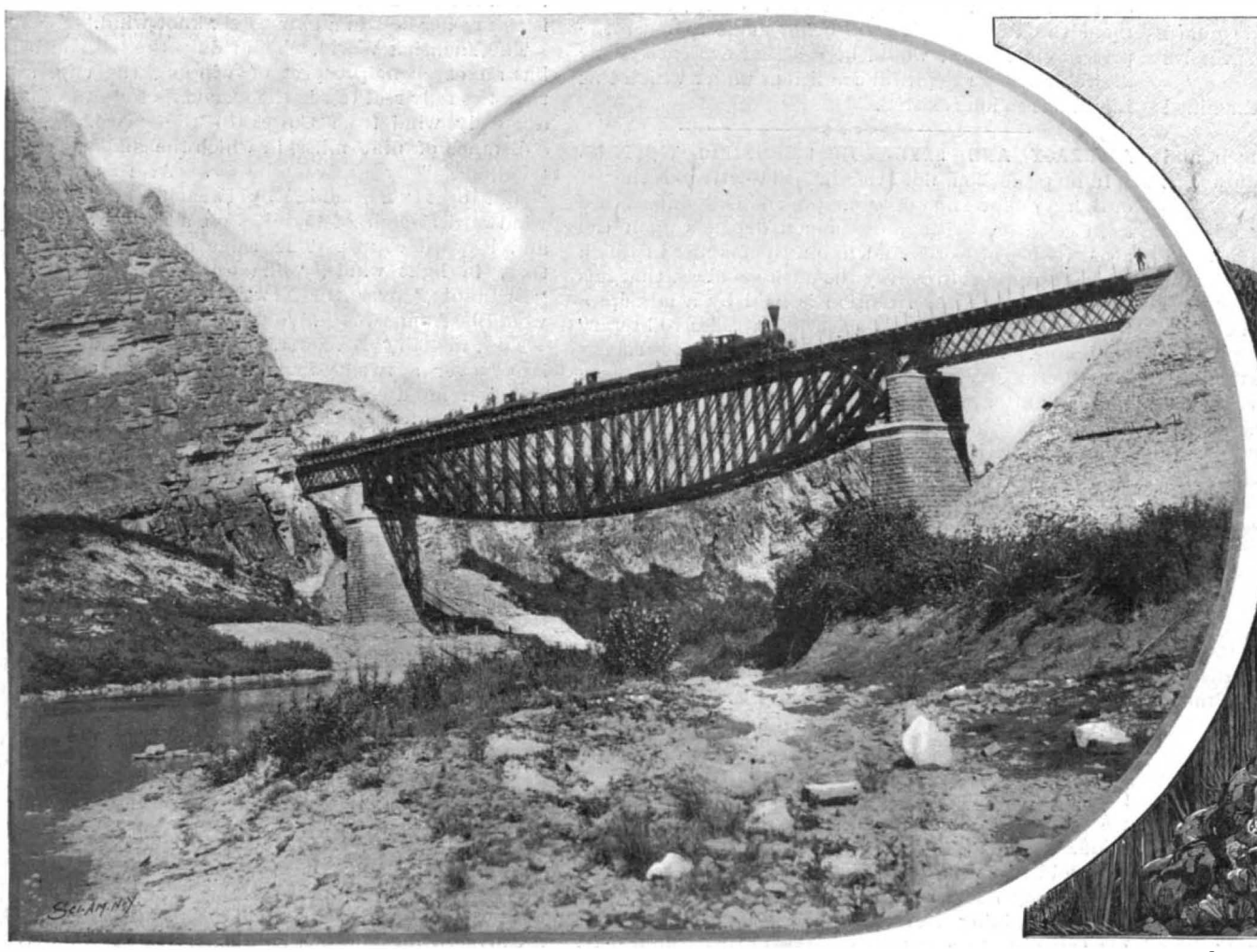
A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

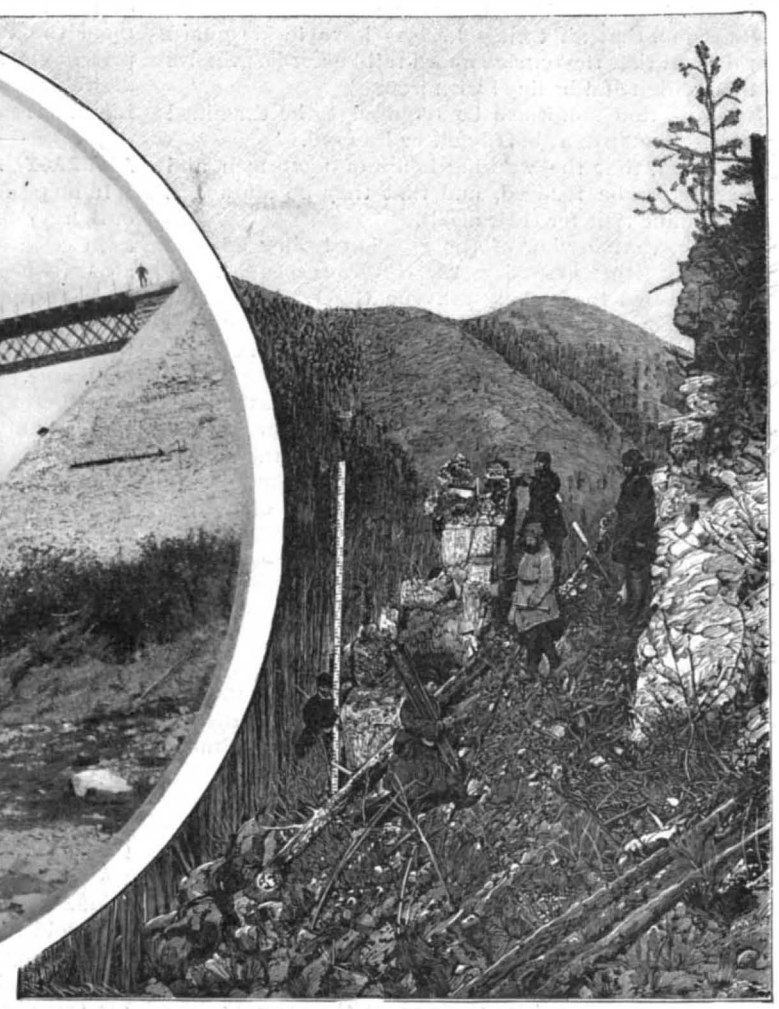
Vol. LXXXI.—No. 9. ESTABLISHED 1845. NEW YORK, AUGUST 26, 1899. [$3.00 A YEAR. WEEKLY.



Erection of 469-foot Steel Trusses for the Great Bridge Across the Yenesei. Total Length of Bridge, 2,975 Feet.



Inverted Bowstring Truss Bridge Across the River Zouriazan.



Surveying Under Difficulties, near the Summit of the Khamar, Dabansk Mountains.

THE TRANS-SIBERIAN RAILROAD.—[See page 136.]

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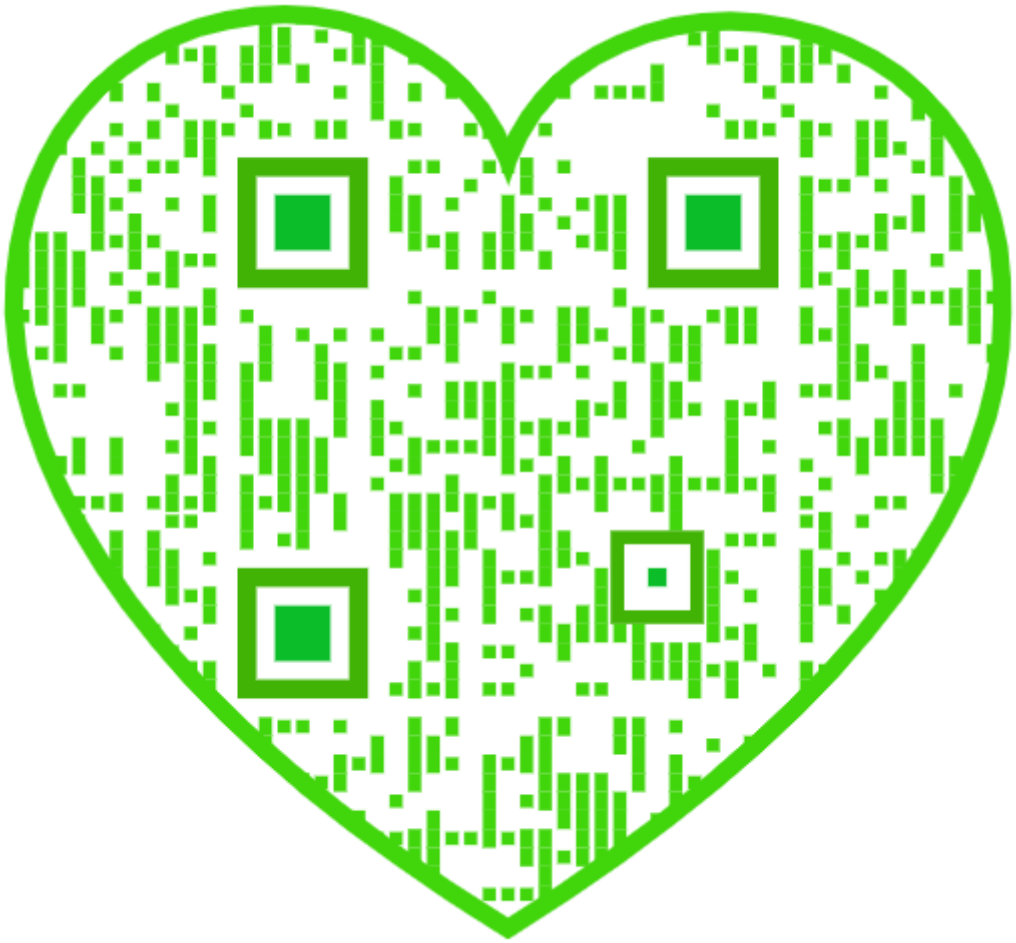

Scientific American.

ESTABLISHED 1845

MUNN & CO., - - - EDITORS AND PROPRIETORS.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, - - NEW YORK.

TERMS TO SUBSCRIBERS

One copy, one year, for the United States, Canada, or Mexico $3.00
One copy, one year, to any foreign country, postage prepaid. £0 16s. 5d. 4.00

THE SCIENTIFIC AMERICAN PUBLICATIONS.

Scientific American (Established 1845).....$3.00 a year.
Scientific American Supplement (Established 1876) ..... 5.00 "
Scientific American Building Edition (Established 1885)..... 2.50 "
Scientific American Export Edition (Established 1878)..... 3.00 "

The combined subscription rates and rates to foreign countries will be furnished upon application.
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MUNN & CO., 361 Broadway, corner Franklin Street, New York.

NEW YORK, SATURDAY, AUGUST 26, 1899.

THE PROBLEM OF THE NEW CRUISERS.

So serious do we consider the proposal to provide our six new cruisers with the very low speed of 16½ knots and a deck that is only partially protected, that we shall take up this question again in our next issue and present further facts and an illustration of the proposed ships which is being prepared from the official drawing. We take this opportunity of drawing attention to the fact that the proposed displacement of 3,400 tons for these ships as given in the comparative table published in our last issue has been raised to 3,500 tons and should so read in the table. Starting with a displacement of 2,500 tons, as authorized by Congress, the maximum displacement was raised first to 3,400 and finally to 3,500 tons.

THE STRATFORD TROLLEY DISASTER.

In our last week's issue we gave illustrations of the bridge at Stratford, Conn., and an outline of a plan showing how the accident might have been prevented.

We note that the verdict of the coroner's jury, which was rendered on the 17th inst., confirms our view of the matter; first, that by reason of the rapid running of the car and the defective condition of the approach adjoining the bridge, the car was derailed; second, that the stringer or guard rail outside of the track, although of the style generally used on all railroad bridges, was not effective in this case by reason of the speed and momentum of the car; third, that the car approached the bridge at a dangerous rate of speed; fourth, that the motorman was guilty of criminal carelessness in running the car at such high speed.

The Shelton Street Railway Company is found very negligent in allowing the track to be insufficiently filled in and supported by earth near the bridge abutment, and in view of such condition to neglect to have a constant, all-day inspection. The jury also recommends:

First, that all cars be required to stop before crossing the bridge 30 feet distant from either end of the bridge.

Second, that all trolley bridges have inside guard rails and that the outside guard rail be not less than 8 inches high and be lined with iron.

Third, that motormen be required to be examined before a competent board and be licensed.

Fourth, that the working hours of motormen and conductors be reduced, and that they be allowed a reasonable time for their meals.

Fifth, that in view of the growing trolley mileage and its further extension, the Governor of the State be requested to specially convene the Legislature for the purpose of creating a commission whose duty shall be to supervise the construction and operation of trolley lines.

We think these recommendations are particularly timely, and should have the effect of compelling all companies to put the tracks over bridges in the best of order, so that they will be safe against any possible emergency that may arise in consequence of the neglect or carelessness of motormen.

A NATIONAL OPPORTUNITY.

The awful desolation which has fallen upon our newly-acquired possession of Porto Rico has aroused the compassion of the civilized world, and sympathy with the stricken inhabitants is already manifesting itself in the active measures of relief which are being taken in various parts of the globe. It is to the United States, however, as the parent country to whose guardianship they have only recently committed the interests of their island that these homeless and starving people turn in their hour of extremity, and we shall be false to our trust, to our traditions, and to our reputation as a generous and warm-hearted race, if we fail to make an immediate and overwhelming response.

The active measures of relief which were started immediately upon the receipt of Secretary Root's letter to the mayors of the cities throughout the country show that the cry of the Porto Ricans will not be unanswered; but the danger of the situation lies in the fact that the country may fail to appreciate the absolute thoroughness with which the hurricane did its work, and the enormous amount of supplies which must be poured into a country from which both the people's homes, and the season's crops upon which they were to subsist, have been swept away. An American physician who was in Ponce during the storm states that the hurricane which devastated the island destroyed every stalk of sugar cane, every coffee tree, and every banana tree in its path, and sent the starving peasants trooping in from the interior to find an equal desolation on the seaboard. The official estimate by our military governor is that two thousand have been either killed outright or have died from injuries received during the hurricane. The number of homeless has been roughly estimated at over one hundred thousand.

The war to which we owe our present possession of Porto Rico was undertaken in the interests of humanity and not with the idea of conquest or possession. The statement to this effect was received with the ironical skepticism which was to be expected, and our present government of the islands which have passed into our care is being closely and curiously watched by those nations who believed that it was conquest and not humanity that prompted the declaration of war. In the relief of the Porto Ricans we have a splendid opportunity to prove that, unlike our predecessors in the tenure of the island, we hold it rather for what we can impart than what we can take away. It has ever been a part of "the white man's burden" in the work of civilization to carry the hunger and pestilence-stricken millions through their hours of sorrow, and we must see to it that these helpless people are both fed and clothed and housed, not merely for a day or a month, but until the exigencies of the situation permit them once more to become self-supporting.

But while the present sad plight of the Porto Ricans is largely due to unpreventable natural causes, its recurrence may be to a very great measure prevented by executing the proper engineering works for the control of the tropical floods. We are assured by a Porto Rican who was long resident in the island that it will be found that most of the destruction and fatalities were due to the floods and not to the violence of the hurricane. The island is traversed by a mountain range from which innumerable ravines, each with its own stream running through it, descend to the sea. During six to eight months of the year these streams are dry, but during such rainstorms as accompanied this hurricane, they become raging torrents. The topography of the country is such that it would be possible to impound these torrential waters, and utilize them for irrigation of the lowlands during the long dry season. By constructing a system of reservoirs, and by canalization of the larger streams, it would be possible, if not entirely to prevent, or least to control such devastating floods as have just occurred. The provision of such a system was frequently urged upon the Spanish government, and its execution, now that the island has passed into our hands, should receive the earnest consideration both of the government and the capitalists of this country. Such a system of works, following upon the efforts which are being made to meet the present emergency, would be a signal evidence of our desire to better the pitiful conditions under which this island has so long existed.

ACCURACY AND STYLE IN SCIENTIFIC WRITING.

In no profession, not even in belles-lettres, is the art of literary expression of such pre-eminent importance as in scientific writing. So much depends upon the accurate use of words and upon the manner in which they are grouped to convey the author's ideas, that it is surprising how little attention is paid by a large proportion of the writers of scientific articles to literary technique. Each mail brings to the editor's desk many contributions which, although they often contain subject-matter of considerable worth, are rejected because of their looseness of expression and general lack of literary merit. No doubt much of the difficulty experienced by the average student in mastering some apparently obscure scientific exposition is due to the author's inability to express himself with that clearness which is so essential to all forms of good writing. Popular science, in the opinion of many, is often a poor kind of science; but it owes no small share of its popularity to the perspicuity and simplicity which has characterized the style of its writers.

No man has greater need of a masterly command of the technique of his language than the scientist. He should devote much of his time to analysis in the verbal laboratory as well as in the chemical and physical, in order that he may habitually select his words and frame his sentences with a careful regard for their fitness to convey exactly and lucidly the thought in his mind. What is implied by literary technique is admirably told in the introduction to "Pierre et Jean," in which Guy de Maupassant narrates how under the rigorous training of Flaubert he was made to individualize an object so as to distinguish it from all others. One of the passages bears so directly on the topic under discussion, describes so admirably in its nervous French how Flaubert taught the youthful Guy to acquire skill in literary expression, that we cannot refrain from quoting it here:

"When you pass," he (Flaubert) said to me, "a grocer seated in his doorway, a concierge smoking his pipe, a row of cabs, show me this grocer and this concierge, their attitude, their whole physical appearance; suggest by the skill of your imagery their whole moral nature, so that I shall not mistake them for any other grocer or any other concierge; make me see by a single word wherein a cab-horse differs from the fifty others that follow or precede him. . . . Whatever may be the thing which one wishes to say, there is but one word to express it; but one verb to animate it; but one adjective to qualify it. It is necessary to seek this verb, this adjective, until they be found, and never to be satisfied with anything else."

A method so painstaking and refined would perhaps tend to destroy a writer's freshness and spontaneity; but for the scientist we cannot imagine a better course to be pursued.

The novelist or the essayist undoubtedly has an advantage over the scientific writer in so far as his subject is apt to be lighter, more easily followed, and, perhaps, more fascinating to the average reader. The mental effort of glancing through a novel or light magazine article is less than that of reading a treatise on stellar chemistry or biology; but it is within the power of a brilliant stylist, like Huxley, to render the effort pleasurable, even though the subject-matter be abstruse or in a popular way unattractive. The inaccurate use of a word in the one case has but little effect upon the context, and, indeed, may even be unperceived by the reader. In a scientific article, on the other hand, an expression carelessly used may render a whole passage obscure, or completely distort the meaning of a sentence. Hence, as some one has cleverly said, the aim of writing, and especially of scientific writing, is not that one may be understood, but that one may not be misunderstood.

Upon a vast number of readers, unfortunately, the refinements of literary art are lost. To many it is a matter of no moment whether an author vary the beginning of his sentences, whether his figures be apt and correctly employed, or whether he show discrimination in the use of words. But although the reader of a scientific article may not appreciate or make any note of the literary style of a writer, the result on his mind of clear exposition, terse description, and logical sequence of ideas is immediate and sensibly gratifying.

"COLUMBIA" AND "SHAMROCK" IN LIGHT WEATHER.

In our issue of August 12, we made a careful comparison of the speed of "Columbia" and "Shamrock," based upon their performance in wholesail breezes. At that time "Columbia" had not had an opportunity to test herself in light airs against "Defender" in a match race, nor were reliable particulars of the second "Shamrock"-"Britannia" race, which it will be remembered was sailed in a very light wind, at hand. During the past two weeks, however, the cruise of the New York Yacht Club has afforded several light weather tests, in which "Columbia" has shown remarkable speed, winning from "Defender" by even greater margins than her owners had looked for. At the same time the expert accounts of the race in light winds between the two English yachts show that "Shamrock" is also at her best in a four to six-knot wind.

The Yachting World, which thinks the "Shamrock" has an excellent prospect of winning the cup, says that the only real test in the second race was a beat in a steady wind from Cowes to the Norman Fort, a distance of nine miles, in which the challenger beat "Britannia" by twelve minutes. At this rate, she would beat "Britannia" by twenty minutes in the windward stretch of 15 miles on a 30-mile windward and leeward course. The same authority estimates that, in light winds, "Shamrock's" superiority to "Britannia," over the New York Yacht Club course would be from twenty-five to twenty-eight minutes.

Now, in 1895 "Defender," in light airs, beat "Vigilant" over a twenty-four mile triangular course by eighteen minutes, although it was estimated at the time that, allowing for shifts of the wind favoring "Defender," the advantage was about twelve minutes. This would amount to fifteen minutes in the thirty miles. "Columbia" has beaten "Defender" by nineteen minutes in twenty-three miles, the race being sailed at the average speed of about five knots an hour. This would amount to twenty-five minutes in thirty miles, and adding the fifteen minutes by which "Defender" has beaten "Vigilant," we find that "Columbia" is forty minutes faster than "Vigilant" or "Britannia" over a thirty-mile course in light winds. This agrees with the results in the recent cruise, where "Columbia" showed an advantage of nearly an hour over "Vigilant," the latter sailing in her cruising trim. In light airs, then, "Columbia" would appear to be from twelve to fifteen minutes faster than "Shamrock" in thirty miles.

These results are not inconsistent with those arrived at in our comparison of the boats in wholesail breezes, in which "Shamrock" appeared to have a slight advantage on a windward and leeward course. For a boat that is canvased for light airs may be relatively indifferent in a strong wind. "Valkyrie III." won from "Britannia" in a light wind by over eighteen minutes; but

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"Britannia" turned the tables by beating the big cutter by between three and four minutes in a strong breeze, and, similarly, "Columbia" was only one or two minutes ahead of "Defender" at the end of a 37-mile race sailed in a stiff breeze at the rate of over 12 knots an hour.

THE HEAVENS IN SEPTEMBER.

BY GARRETT P. SERVISS.

With the fall of the year the glories of the southern heavens depart, but high in the north the splendor of the stars is enhanced. September witnesses the beginning of the reign of the "royal house of Cepheus." Opposite to the Great Dipper, as it sinks toward the horizon westward from the pole, will be seen rising Cepheus, Andromeda, Cassiopeia, and Perseus. Cepheus lies between the head of the Northern Cross (Cygnus) and the Pole Star. Just east of Cepheus is Cassiopeia, unmistakable on account of its curious zigzag figure, formed by five stars, four of the second and one of the third magnitude. South of Cassiopeia is Andromeda, marked by an extended row of four stars, three of the second magnitude, the most westerly and southerly standing at one corner of the Great Square of Pegasus. Following Andromeda and Cassiopeia from the northeast comes Perseus, the hero of the world-famous story which gave this group of constellations to the map of the sky. The Milky Way, running in bright reaches from Cygnus downward through Cassiopeia and Perseus, adds its sheen, like a royal baldric, to the beauty of their stars. Between Cassiopeia and Perseus even a careless eye detects a curious shining spot. It is the celebrated gathering of minute stars constituting the "sword handle" of Perseus, and is one of the finest objects in the heavens for a low-power telescopic view. An opera-glass shows many of its twinkling multitude. Draw an imaginary line from the Pole Star through the bow-shaped row of stars marking the middle of Perseus, and extend it about ten degrees further south, and it will lead the eye to a little lone group, the brightest member of which is very famous under the name of Algol. It is, perhaps, the most remarkable variable star in the heavens. There will be a minimum of Algol on September 11 a little before 10 o'clock P. M., Eastern standard time.

THE PLANETS.

During September four of the planets will be in the constellation Virgo, viz., Mercury, Venus, Mars and Jupiter. Two of them, Jupiter and Mars, are in that constellation at the beginning of the month. Mercury and Venus enter it later, moving eastward from Leo.

Mercury is a morning star, reaching its greatest western elongation on the 5th, when it should be conspicuous before sunrise, since it is then within a few days of perihelion and consequently nearly at its greatest brilliancy. No planet undergoes such alternations of light and heat as those of Mercury. When in perihelion the sunlight falling upon its surface is more than twice as intense as in aphelion. At the end of the month, Mercury passes behind the sun, emerging as an evening star in October.

Venus is also a morning star, but much nearer the sun than Mercury, and on the 16th it will pass behind the sun in superior conjunction.

Mars, in Virgo, is an evening star, but inconspicuous.

Jupiter, in Virgo, is also, of course, an evening star, showing bright in the west after sundown. About the 6th Jupiter crosses the line from Virgo into Libra.

Saturn, in Ophiuchus, just north of Scorpio, will remain a conspicuous evening star during September, gradually drawing westward and setting earlier. Its brightest satellite, Titan, will be south of the planet on the 2d and the 18th, west on the 6th and the 22d, north on the 10th, and east on the 14th.

Uranus, in Scorpio, and Neptune, in Taurus, although wide apart, are both evening stars.

The sun enters Libra, and the astronomical autumn begins, on the 23d at 1 A. M., Eastern time.

THE WALTHAM WATCH TRADE-MARK.

A most interesting decision was rendered a few days ago by Judge Townsend in the United States Circuit Court for the Southern District of New York, in the case of The American Waltham Watch Company vs. Joseph H. Sandman.

The complainants, Messrs. Robbins & Appleton, are the makers of the well-known "Waltham" watch which is held in such high estimation both at home and abroad.

The following is a brief summary of the principal points in the decision:

Complainant is and has been for nearly fifty years a manufacturer of watches at Waltham, Massachusetts; it was practically the pioneer in the watch business in this country; prior to 1854, the date of the establishment of its business, only two attempts had been made in this country to manufacture watches, both of which were unsuccessful; its business has grown to an enormous extent, nearly eight millions of watch movements being sold by it, all of which, with but few exceptions, have borne the name "Waltham," and over a million of dollars have been expended by it in advertising and familiarizing the public with its watches. It appears that originally the name "Waltham" was thus used in a geographical sense, but by continued use it has acquired a secondary meaning as a designation of watches of a particular class, and purchasers have come to understand that watches stamped with the name "Waltham" are watches made by complainant.

In 1895, one E. A. Locke, for whom this defendant was sole selling agent, began the manufacture of watches at Waltham under the name of "Columbia Watch Company." Said Locke was not a resident of Waltham.

Said Locke has made watches similar in appearance to those manufactured by complainant, and stamped with the words "Waltham, Mass." They were sold for a much lower price than those of complainant.

The complainant claimed that by the use of the name "Waltham" purchasers were actually deceived into believing they had purchased the original Waltham watches, when in reality they had bought watches of defendant's manufacture.

The controlling questions herein have been elaborately discussed by Judges Knowlton and Holmes of the Supreme Judicial Court of Massachusetts in Am. Waltham Watch Company vs. United States Watch Company (Mass.) In the views therein expressed, I heartily concur.

The ground of said decisions is that such conduct is in violation of the law against unfair trade, and is intended to deceive and defraud the public and to deprive the complainant of the trade and good will to which it is entitled.

In the course of his opinion Judge Knowlton said:

"I am of the opinion that this word (Waltham) has acquired a secondary meaning in connection with the plaintiff's watches, of which the defendant has no right to avail itself to the damage of the plaintiff, and that there should be an injunction against the use by the defendant of the word 'Waltham' or the words 'Waltham, Mass.' upon the plates of its watches without some accompanying statement which shall clearly distinguish its watches from those manufactured by the plaintiff. I find that the use of the word 'Waltham' in its geographical sense, on the dial, is not important to the defendant and that its use should be enjoined. Specimens of watch movements were put in evidence by the plaintiff which showed that it would not be difficult to make prominent upon the plate, in connection with the words 'U. S. Watch Co., Waltham, Mass.' the words 'No connection with the Am. Waltham Watch Co.' or 'Not the original Waltham Watch Co.,' or similar explanatory statements."

And Judge Holmes, delivering the opinion of said court sustaining the decision of Judge Knowlton, said:

"Whatever might have been the doubts some years ago, we think that now it is pretty well settled that the plaintiff merely on the strength of having been first in the field may put later comers to the trouble of taking such reasonable precautions as are commercially practicable to prevent their lawful names and advertisements from deceitfully diverting the plaintiff's custom."

A decree may be entered for an injunction and an accounting.

DEATH OF PROF. BUNSEN.

In the death of Robert Bunsen science has suffered a most severe blow. He was almost the last of the great men who have made modern science what it is to-day. His long and useful life was filled with the most splendid achievements in many sciences, but it was as a chemist that he will be chiefly remembered.

Robert Wilhelm Eberhard von Bunsen was born in 1811 at Göttingen, where his father was a professor; naturally he matriculated at the university, studying under Gauss. He graduated in 1830, then went to Paris; he then spent a year in Berlin and a year in Vienna. In 1833 he became professor of chemistry at the Polytechnic School in Cassel. In 1838 he was appointed to the chair of chemistry in the University of Marburg, where he remained for thirteen years. He afterward went to Breslau, from whence he removed to Heidelberg; where his brilliant researches were instrumental in giving that university the high place which it occupies to-day.

Among his earliest researches were those on Cadet's Fuming Arsenical Liquid and his memoirs on the subject are classical. Next he turned his attention to the examination of the chemical changes that occur in the blast furnace, and in 1838 he proved, by accurate analyses, that by the gases escaping at least 42 per cent of the heat evolved from the fuel is lost and that in view of the ease with which such combustible gas could be collected and led off to a distance for subsequent use, a new and important source of economy in iron manufacture was rendered possible. He invented the hot blast, which has enriched every person in the civilized world. His measurement of gases coming from the furnaces was reduced to so fine a point that vast economies were introduced. His discoveries proved lucrative and he was able to travel and carry on geological investigations, of which he was very fond, in Italy and Iceland, studying volcanic phenomena in the former and geysers in the latter country. His theory of geysers is still accepted by many scientists. It was about 1841 that he began his studies on electrolysis and the electric arc. In the same year he invented the battery cell which is named after him. It was of the greatest possible use until the introduction of the dynamo. He prepared a number of metals by electrolysis which had hitherto been produced only in minute quantities. His studies in the more abstract branches of chemistry were at once recognized as of prime importance. His researches on spectrum analysis were most important and his researches and investigations smoothed the way for other chemists. Laboratories of the great institutions of our own and other lands are to-day full of the contrivances of which he was the originator and the Bunsen burner and the filter pump need only be cited. The burner in particular was one of the most valuable inventions ever made; it is used in gas stoves in hundreds of thousands of our homes, and it is equally important in metallurgical processes.

In 1852, when he accepted a call to Heidelberg, it was considered that was the greatest university to which a professor could give his services and he remained faithful to Heidelberg University notwithstanding the flattering offers which were made by the Berlin and other universities.

In collaboration with Kirchoff, he practically created three special branches of science, spectroscopy as a department of optics, spectroscopic astronomy, and spectroscopic chemistry, and we can even foretell with considerable accuracy, by means of his devices, the discovery of new elements.

In looking over the names of the scientists of the last half century, it is almost impossible to find one whose personal contributions to science for the good of the world have been so great as those of Bunsen, and the many hundreds of pupils who during the last half century have been benefited by personal contact with him are now doing the world's work in chemistry in hundreds of laboratories.

He died on August 16 at his home at Heidelberg, Germany.

JAMES RICHARDSON.

James Richardson, who was for several years a valued editorial writer on the SCIENTIFIC AMERICAN, died August 15, at Clear Lake, Sullivan County, N. Y. His death was very sudden and unexpected. He left this city in his usual health not many days since, and no word had been received from him since he reached there. He had been a sufferer from heart disease.

Mr. Richardson was fifty-nine years of age; his birthplace was in the Adirondacks. After he received his education at the Albany Normal School, he went to Kentucky and taught school for several years. He went to the front and served as a private in the Union army until the close of the war. After this he accepted a place on the editorial staff of the SCIENTIFIC AMERICAN, which he filled acceptably for a number of years.

He resigned his position on this paper to become the editor of a promising magazine called Mastery. After this his contributions appeared occasionally in the SCIENTIFIC AMERICAN.

He was the inventor of typewriters and calculating machines, and was an enthusiastic naturalist and deeply interested in scientific advancement.

DEATH OF DR. D. G. BRINTON.

Daniel Garrison Brinton, M.D., the celebrated ethnologist, died at Atlantic City, New Jersey, on July 31, at the age of 62 years. He was born at Westchester, Pa., and graduated from Yale College in 1858; then he took a course of medicine at Jefferson College, graduating with the degree of Doctor of Medicine in 1861. After a year spent in study in Europe, he entered the United States Volunteer Army and served in the medical corps in the Civil War, becoming medical director of the 11th Corps. He was finally honorably discharged with the brevet rank of Lieutenant-Colonel. He did good service in the field and in the military hospitals. It was, however, as an anthropologist that Dr. Brinton was known all over the world. He was most deeply interested in American ethnography and ethnology, and his knowledge of American languages enabled him to publish a series of books that won him world-wide reputation for profound learning. His views were original and his knowledge was unlimited. Scholars did not always, however, agree with his conclusions. We have at various times published some of Dr. Brinton's lectures, which are remarkable for their lucid style and masterly array of data.

JAPAN PURCHASES BRIDGES.

The Imperial Government Railroad, of Japan, has ordered from the Pencoyd Iron Works between seven and eight thousand tons of steel bridges which are to be delivered within a year. The order consists of 45 one hundred foot spans and a number of two hundred foot spans. This is the largest export bridge construction contract ever placed in the United States, and it goes to the builders of the Atbara bridge in the Soudan.

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SELF-PROPELLING STEEL CANAL BOATS.

BY WALDON FAWCETT.

The past decade or two has witnessed the advent on the great lakes of America of a number of novel and unique craft, prominent among which is the ice-crushing type of steamer, whose introduction by the Russian government within the past year has been the talk of European engineering circles. It is doubtful, however, if any of these vessels possess the characteristic of absolute originality to the extent of a pontoon barge which is to be constructed within the ensuing year for the Cleveland Steel Canalboat Company, which operates a line of steel canal boats from Cleveland and other ports on Lake Erie via the Erie Canal and Hudson River to New York city.

The whole project of the corporation mentioned has been a series of innovations, and were it not for the success which has attended it thus far, despite freely expressed predictions of failure, it is probable that this latest undertaking would be designated even more chimerical than its predecessors.

The success of the system for the transportation of freight by water without breaking bulk between ports on the great lakes and New York was manifest from the time the idea was placed in practical operation, but it has become more pronounced each successive year. At the outset, however, the influences were decidedly discouraging. The canal men claimed that no iron or steel boat could navigate the Erie Canal, owing to the rocky formation of the bottom of the waterway, while, on the other hand, wiseacres among the lake sailors were confident that no canal boat could weather the storms of Lake Erie.

A good sized fleet of steel barges and propellers has gradually been accumulated and is employed regularly, carrying sugar principally on the west bound trips and grain and flour on most of the east bound trips. All records on the canal have been broken time and again in the matter of time of passage, and the behavior of the boats during some of the very severe storms encountered on Lake Erie has been admirable, the barges bobbing along like corks after the steamer, which is usually assisted in towing by a tug on the Lake Erie portion of the route.

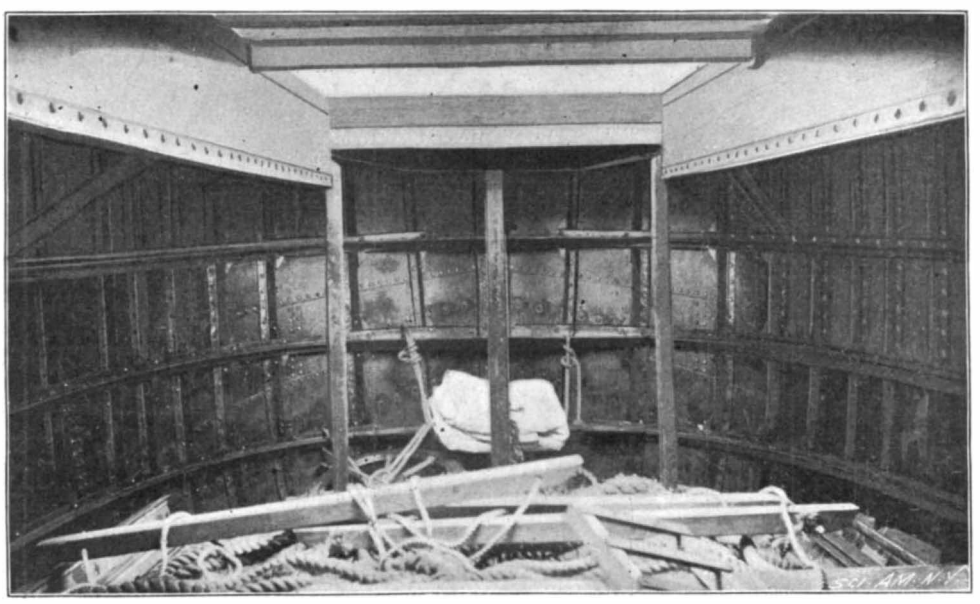
At the same time, Mr. C. E. Wheeler, the inventive genius of the canal boat company, has been wrestling for some time with the problem of the betterment of the plan in so far as it related to the canal boats traversing Lake Erie. Although the boats have time and again proved their ability to weather heavy storms, the management of the line has been averse to sending them out in the teeth of a gale that a regular lake freighter would plunge into with safety. Much time has thus been consumed by delays.

The provision of additional steamers was first considered, but this would mean a dividing up of tows and would thus involve additional operating expense without materially reducing the dangers of the Lake Erie trip. It was at this juncture that the pontoon barge idea was hit upon, and an investigation was at once entered upon, there being to commend it, in addition to the solution of the problems already outlined, the further fact that with this huge vessel in which to move the canal boats from Buffalo to Cleveland and return, more canal boats—especially the wooden boats, which are plentiful and could be rented or purchased at low cost—could be brought into play.

There was, naturally, not a little skepticism regarding the proposed barge at the outset, but the leading naval architects and engineers in the country to whom the plans have been submitted pronounce the scheme entirely practicable, and, moreover, tests made with a working model would seem to justify this confidence in every respect.

The barge, which will be completed in time for the opening of the season of navigation of 1900, will be 360 feet in length, 45 feet beam, and 24 feet in depth. Structurally and in general appearance the craft will be very similar to the regular type of steel tow barge on the lakes; indeed, so strong is the resemblance that a few minor alterations would permit of the conversion of the boat into an ore carrier of the usual type. She will, of course, have a double bottom, and will also be provided with double sides for water ballast, so that in loading and unloading canal boats the operation will follow very closely that of a floating dry-dock. When the canal boats are securely wedged in place the water will be pumped out, it being estimated that the operation will require not to exceed an hour's time.

The method of securing watertightness in the vessel consists of a rather novel arrangement, formed by two huge doors, which insure double protection. One door is hinged at the bottom, while the other is unhinged and lifts perpendicularly. The pumps employed will, of course, be quite powerful. It is expected that this vessel can readily be towed in almost any weather at the rate of nine miles per hour by almost any of the large lake tugs, whereas the speed of the canal steamers towing a fleet of canal boats does not exceed seven miles per hour, and this without reference to the frequent delays on account of the storms on Lake Erie.



CONSTRUCTION OF CANAL BOAT SEEN FROM WITHIN.

The barge will cost in the neighborhood of $159,000, and it will increase the transportation facilities of the company several times over. Officials estimate that it will be possible after the barge is placed in commission to operate a fleet of seventy-two canal boats, and that the barge with six loaded canal boats aboard will make three trips per week between Buffalo and Cleveland. It is claimed that there will be no delay in handling cargoes, as six loaded canal boats will be ready at each port to replace those discharged from the pontoon. Fifteen loaded canal boats will leave New York each week.

The steel canal boats employed in this traffic are themselves of novel design. Both propellers and consorts are each about 100 feet in length by 18 feet beam and 10 feet moulded depth. Each propeller is engined for about 250 horse power. The propellers have a capacity ranging from 125 to 175 tons of freight, while the capacity of the barges ranges from 200 to 300 tons. All of the vessels are constructed of open hearth mild tempered steel of even finer quality than that required by the government in the construction of war vessels. Considering its size, too, the canal boats are stronger than the largest freight-carrying vessels on the lakes.

SELF-PROPELLING STEEL CANAL BOAT.

Antarctic Exploration.

At a meeting held recently by the Geographical Society of Berlin, under the presidence of Herr von Richthopen, the question of an Antarctic expedition was considered. This expedition will probably be undertaken if a sufficient sum can be raised by subscription. From a geographical point of view, the fundamental problem as to the existence of an Antarctic continent has not yet been solved, and besides this there are other questions for which a solution is desired, such as the geological structure and character of the Antarctic soil, this being of importance owing to the relation supposed to have existed between South America and Australia. Among other questions are the study of masses of ice and their movements, the origin of cold oceanic currents, the condition of atmospheric pressure and temperature in those regions, besides the questions relating to terrestrial magnetism, etc. Herr von Drygalski presented to the society his plan for making the exploration. The point of departure would be the southern part of the Indian Ocean. The expedition would then proceed toward Kerguelen Land, making scientific observations on its way, and will then endeavor to reach a point favorable for passing the winter, from which it will start again in the spring toward the magnetic pole over the ice. In the autumn the expedition would return by a route chosen as far toward the west as possible, along a line of coast which it is supposed would be discovered. The boat carrying the members of the expedition would be constructed almost entirely of wood, in order not to affect the magnetic observations. Its construction would be carried out according to data specially determined for resisting the storms of the southern seas, where, on the other hand, the pressure of ice is less to be feared than in the Arctic regions.

Disposal of Wastes in Paris.

In a report presented to the Société des Ingenieurs et Architectes Sanitaires of Paris, M. Périssé shows that four different processes have been proposed for disposing of the household waste of the city. 1. Direct employment for agriculture. 2. Incineration. 3. Steam treatment. 4. Grinding. He eliminates the first three of these processes for various reasons, and recommends the fourth, on account of the favorable results which have been obtained by a small testing plant installed near the city, and which in the first half of 1897 treated 50 tons of waste matter every day. The output of the plant may, however, be increased to 200 tons per day without difficulty. By this process, the waste passes over an endless web, and hard or bulky substances are extracted. The remainder is torn into fragments by means of toothed steel wheels, and upon coming out of the mill it falls directly into the wagon which is to transport it. According to M. Périsse, this process is by far the most economical. It has the advantage of preserving all the fertilizing principles and at the same time gives it a form which facilitates handling and distributing upon the soil. The process is arranged so that the grinding is effected immediately, and thus fermentation does not commence before it has reached its destination.

At the Paris Exposition special effort will be made to make a striking exhibition of Indian corn and its food products. It is intended to establish in connection with the American agricultural exhibits a "corn kitchen," in order that the visitors may be furnished with all kinds of maize foods. It is hoped that this will increase the market for American corn.

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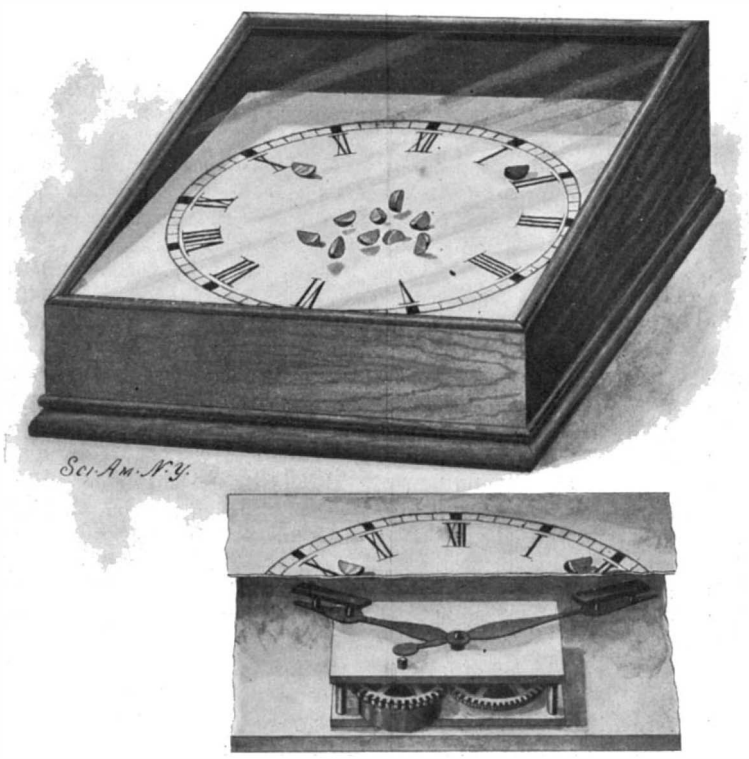
A MEXICAN BEAN CLOCK.

A few years ago public curiosity was excited by the curious beans called the "devil beans of Mexico," which shopkeepers placed in their windows. They somewhat resembled roasted coffee beans in shape and color. They were also known as the "jumping beans," owing to the fact that from time to time they made spasmodic movement which propelled them quite a little distance. The beans grew on a small bush in the Mexican mountains, and it is conjectured that they belonged to the order Euphorbiaceæ. The bean really consisted of three similar pods which formed a single bean. It is usually a third of the bean which was exhibited as a curiosity. On opening the pods it was found that it contained a small larva something like that frequently found in chestnuts. It is this little occupant which gives motion to the bean by its jerks and thumps against the side of its home. If the bean is slightly warmed, it begins to turn from side to side and perhaps, with a sudden jump, turns completely over and stands on one end, and then, by successive jumps, moves quite a distance.

Those who are not in the secret are often greatly puzzled by this strange bean. An enterprising jeweler devised a scheme of utilizing them to make a magic clock. He accomplished this by imitating the shape of two of the beans, making the dummy beans out of soft iron; one he gilded and the other he silvered. The prepared iron beans were placed with the ordinary jumping beans on a thin white piece of pasteboard, outlined and numbered like the dial of a clock, but devoid of the hands. This dial was located over the works of a large clock which was placed face upward on the floor of the store window. He fastened small magnets to the ends of the hands. The works were of course carefully hidden from view. All that was in evidence was the cardboard clock dial and the jumping beans, among which were the gold and silver painted iron beans. These were placed on the cardboard over the concealed hands with the magnets attached. The magnets were moved by the hands of the clock so that they were almost in contact with the cardboard. As they moved around, they carried the iron beans with them, thus telling the time of day, and the public was greatly interested by the intelligence shown by the two beans, which distinguished them from their lively associates.



A MEXICAN BEAN CLOCK.

A NOVEL FIRE-ESCAPE.

Our engraving gives an idea of a novel fire-escape which has been erected at a Louisville, Ky., school. It consists of a chute and a spiral slide, which is so constructed that it controls the speed of the body descending, the speed being no greater at the bottom than at the beginning of the descent. Escapes of this nature are in use in a large number of factories, schools, and institutions in the South. It is known as the Kirker-Bender fire-escape and is made by the Dow Wire Works Company, of Louisville, Ky.

It consists essentially of an exterior vertical steel cylinder 6 feet in diameter, extending from the ground to the roof and provided with entrances from the building at every floor. The cylinder is a thin shell containing a small concaved spiral surface extending from top to the bottom and forming a continuous chute down which the occupants of the building can easily and rapidly slide to the exit at the ground. The chute is made of steel plates, stamped to a uniform curvature and overlapping each other like shingles at their lower edges. They are riveted to the sides of the shell and are secured to a 3-inch steel pipe which forms the vertical axis of the cylinder; the plates are smooth and polished. The entrances to the cylinders are through rectangular steel extensions riveted to the side and having double-leaved spring doors which open readily by pressure from the outside. The exit is a similar double-leaved spring door, which opens by a very slight outward pressure.

The fire-escape is set about 2 feet clear of the building, and connections are made with it from the windows. In use it is only necessary to pass through the window on to a smooth platform and then open the door by a slight pressure and get on the chute in any convenient position. The tendency is naturally to assume a sitting posture on the spiral surface, and the descent is made feet first. The center pipe is utilized as a standpipe and is provided with fire hose couplings. A firemen's iron ladder is also run up outside to give independent access to the roof. There are a number of buildings in Louisville which have been equipped with this fire-escape. A descent from an escape 61 feet high was made in 16 seconds. On one occasion over 50 people passed through the same escape, and some of them descended head foremost without accident or trouble. At another school 135 people, including a lame boy with his crutches under his arm, descended through it safely in one minute.

As the doors close automatically, smoke and flames are excluded, and it would be possible to pass by a burning story when it would be impassable by an open stairway. The same scheme can be applied to a fireproof shaft in the interior of the building.

A SPIRAL SLIDE STEEL FIRE-ESCAPE APPLIED TO A SCHOOL.

Russian Color-Printing Machine.

The Orloff machine for printing in colors is, in its operation, a departure from any machine hitherto used for a like purpose, says Engineering. It is the invention of Mr. Ivan Orloff, chief engineer and manager of the Russian Government Printing Works, at St. Petersburg, and it possesses many points of interest. In the ordinary flat color printing machine, the successive colors are applied one at a time as each one becomes dry, but the Orloff machine puts down all the colors on the paper at once, so that a great saving of time is effected. The principle of the machine is as follows: The blocks which take the different colors are fixed to a cylinder of large diameter, and each block receives the supply of colored ink intended for it, and as the cylinder revolves, the ink on each block is transferred to a composition roller very similar to an ordinary inking roller. After all the colors have been transferred to this roller, each in its proper position, an engraved block or form follows, and receives a perfect impression from the composition roller. Thus impressed, the form passes on and comes in contact with the paper on the impression cylinder, where it prints all the colors at one operation. The whole of these various transfers are performed during one revolution of the cylinder.

While the blocks pass under the inking rollers, the latter are, at the proper time, lowered by a system of cams so as to come into contact with the blocks which they are intended to ink. The number of colors that can be used is only limited by the number of blocks and the size of the machine. All the operations go on continuously, as the cylinder revolves in one direction only. The number of finished impressions is stated to be about 1,000 per hour. The machine was originally designed for the Russian government to print multi-colored patterns for banknotes, and it appears to be well adapted for this purpose.

We understand that the Russian authorities have thirty-two of these machines at work in St. Petersburg on their new issue of paper money, and also producing banknotes for the Chinese government.

Experimenting on Smoke in Tunnels.

Prof. Mosso has been recently experimenting on smoke in tunnels, the scene of his labors being a long tunnel not far from Genoa, through which some 200 trains pass a day, leaving an immense amount of smoke. Two methods were tried; first compressed air was used. Large cylinders of steel were filled with air and compressed to 750 pounds to the square inch. The cylinders were 5 feet long and 2 feet wide and were strongly built to resist the enormous pressure. These were placed in the tender of the locomotive. In passing through the tunnel the air was allowed to escape. The pure air blew back the smoke and purified the atmosphere. The second method was with compressed oxygen. This was allowed to escape through the cylinders into the fires of the engines, causing complete combustion, and preventing the formation of dangerous gases as well as making the air purer by the addition of the oxygen. The compressed air method is to be adopted, as it is cheaper and almost as good as the oxygen. Of course the best solution would be to run the trains through the tunnel by electricity, as is done in Baltimore.

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Correspondence.

The Hornet's Nest Again.

To the Editor of the Scientific American:

Though I am not a subscriber, nevertheless I am a frequent and an interested reader of the Scientific American. An article on "The Hornet and its Home" appeared in the issue of April 8, 1899, and enlisted my attention at once. The author, Mr. Hervy Laney, is an earnest student of insect life, evidently, and a most pleasing writer.

I make bold, however, to disagree with one of the writer's statements. In the sixth paragraph, concerning the work of the parent hornet, he says: "She carefully places in the cell food enough to last the pupa until it matures into an insect, seals it over with a parchment-like substance, beautifully white, evidently understanding the law of the need of light for the development of the mature insect." I take exception to this on the score that the mother hornet does not complete nor seal the cell containing the pupa. All of the white, translucent part and capping of the cell is made by the pupa itself. When it has reached the sealing age, the pupa emits from its mouth a clear, viscid fluid which it plasters around the rim of its own cell, atop of the mother hornet's work.

As the watery part of the fluid evaporates, it leaves the beautiful white paper finish which is so conspicuous and so charming. Usually the last fourth part of the cell is thus built up and capped by the tiny occupant itself.

My statement can be easily verified by taking a hornet's or a wasp's nest and hanging it in a place where no mature insect can reach it, and yet a place that is warm enough to keep the pupa alive. In a very short time the young insect can be seen worming its way down to the edge of the cell and beginning the work of temporary self-imprisonment.

Altoona, Pa. Henry Howard Stiles.

Metal and Wood Railroad Ties.

BY GEORGE E. WALSH.

The paper read before the International Railway Congress, and published in the Bulletin of the Association, giving some new data about the relative merits of wood and metal railroad ties used by the Liége-Limburg Railway, of Belgium, and commented upon in a recent number of the Scientific American, is interesting in view of some modern experiments in this country with wooden sleepers. The fear that the supply of timber would soon become exhausted, and the price of railroad ties would as a consequence advance to an abnormal figure, has not in recent years troubled railroad companies as much as it did fifteen and twenty years ago; but in spite of the fact that ties do not cost any more to-day than they did ten years ago the railroads have not lost sight of the possible danger they may have to confront any day in the future. The drain upon the forest for supplying the roads with ties is an important one. Fully twenty per cent of the total consumption of lumber is used by the railroads for their ties, telegraph poles, and stations, and as a large proportion of this timber comes from the young, thrifty trees before they have reached full maturity the destruction is far-reaching in its effect.

The effort to economize in the matter of ties and telegraph poles has been one of the features of modern railroad management. Lately the Forestry Division of the Department of Agriculture has instituted careful experiments and researches for the purpose of lessening the forest destruction by the railroads. Until metal ties are substituted for wooden ones the drain upon the forest will be enormous. In Europe, where lumber is scarce and high-priced, metal ties are in common use, but the fact that they have not found favor here is due to the relative abundance of forests and the unwillingness of American railroad companies to adopt an inferior substitute. When the perfect metal tie has been found, the roads will quickly take it up and make the fortune of the lucky inventor.

The question of increasing the durability of timber is more important to the railroads than to any other class of consumers. In the past the average life of a tie in the United States has been a little less than seven years, and if this can be increased to ten the saving to the railroads of the country would be enormous. It takes upward of 80,000,000 ties to renew those worn out and decayed; that is, the average of renewals needed for each mile of track each year is 417 ties, or about 15 per cent of all the ties on the track.

To increase the durability of the ties the Forestry Division has made experiments which go to show that the time of felling the timber has much to do with the length of the life of the ties. Early winter cutting is recommended for various good reasons. There is the minimum of sap in the trees then, and the weather is too cool for fermentation to get in, while the trees will season more slowly and evenly. Moreover, trees cut in the sap are more liable to the attacks of insects. The decay of wood is caused by a fungus which lives on the wood, and warm weather is favorable to the growth of this rot. Some woods are more susceptible to the attacks of the fungus than others, but the little animals will in time injure the best timber, and cause what we call rot. When damp or sappy the fungus enters the wood more readily than when dry and cold. To prevent the fungus from attacking the ties it is recommended by the Forestry Division to paint the ties and poles with various compositions. A mixture made up of three parts coal tar and one part unsalted grease is considered one of the best compounds for painting the newly cut railroad ties. Carbolineum, made of heavy tar oils freed of their volatile and heavy tar constituents, is a mixture that many of the roads use for their ties. This oil not only forms a protecting coat for the ties, but it acts as an antiseptic, penetrating the wood and killing the fungi. By adopting these various preservatives some of the roads have increased the average life of their ties from seven to eight and nine years.

In the East the bulk of the railroad ties are cut from second growth timber. The specifications of the roads demand that only one tie shall be cut from each tree, and this method secures the choicest ties, but it denudes the forests rapidly. As only straight, perfectly developed trees are selected for ties, the woods are left with only the small inferior trees. This does not improve the looks of the forests, nor does it promise much for the future. It is only a question of time before all the good trees suitable for ties will be cut down, and the supply will be reduced so that metal substitutes will have to be found.

Substitution of wood for ties has already undergone a great change. Originally the chestnut was considered the finest tree for supplying railroad ties, but forests of chestnuts are scarce in all parts of the country. Oak and pine have both succeeded the chestnut. Of the 80,000,000 ties used for renewals each year, about 45,000,000 are cut from oak trees, 12,500,000 from pines, 3,500,000 from chestnut, 5,000,000 from cedars, 2,500,000 from hemlocks and the tamaracks, 2,500,000 from redwoods, and 1,500,000 from the cypress trees of the South. Thus the oaks furnished about 60 per cent of all the ties cut annually. The use of the pine trees of the South for railroad ties is rapidly increasing, and when the turpentine or pitch is left in them they last as long as many of the hard woods. This pitch acts as a natural preservative.

When the ties are cut they have to be piled in neat square heaps according to a system that has been found to give the best results. Careless piling of the ties has cost the railroads thousands of dollars in the past, and now they all insist upon proper piling. This consists in putting not more than fifty ties in a heap, and arranged in a square so that each tier contains from six to nine ties, separated from each other by a space equal to the width of one tie. The next tier is made up of one tie at each end, placed crosswise, so that the ties are all separated from each other. By this method the wind circulates freely through the piles, and causes uniform and slow seasoning.

Railroad ties are both sawn and hewn. The former can be had more cheaply, but the latter last much longer. Some roads claim that the hewn ties will last from one to three years longer than the sawn ties. The rougher surface of the sawn ties collects the water, and thus gives the fungus a better opportunity to grow. Nevertheless, the amount of waste of lumber necessary to make the hewn ties often more than counterbalances this difference in the cost.

There is a great diversity in the number of ties used to the mile on the different railroads as well as in the size and quality of timber. The New York, New Haven and Hartford road use 2,800 ties to the mile, three-quarters of which are chestnut and one-quarter oak, while some roads use as few as 2,000 to 2,500 to the mile. Over 60 per cent of the ties are cut 8 feet long, 12 per cent 9 feet long, and the rest 8½ feet. The 9-foot ties are used chiefly by the Southern and Gulf group of railroads, where pine timber is very abundant and cheap. The New England roads have their ties cut from 5 to 6 inches in thickness, while the Southern roads seem to prefer 7-inch ties. The width of the ties likewise varies from 5 and 6 inches in New England to 8 inches in the Central Northern and the Southern roads.

The tendency to economize on the ties in the East is thus apparent in the size of the sleepers selected, while in the Southern and Western States where timber is plentiful there is no such attempt to reduce the width, length, and thickness of the ties. The denudation of the forests in the East has made it difficult work for the great railroads to secure all of the ties they require for annual renewal of the roadbed. Most of them have exhausted all of the available timber along the line of the track, and with the exception of a few scattering lots cut by farmers and small wood owners the ties have to be brought from long distances. One of the important phases of the coast trading business of our lumber ships is the carrying of railroad ties from the woods of Canada to New York and Boston. Cedar ties are now brought in large quantities from New Brunswick and the woods of Maine to this city. This white cedar makes pretty good ties, and its abundance makes the ties cheap. The lumber schooners come from New Brunswick by way of the Bay of Chaleur, the great shipping point for cedar ties, and they are delivered by cargo lots at 30 cents apiece. Hundreds of thousand of the ties are shipped by rail and delivered to the New York and New England roads at the rate of $12 per thousand feet, board measurement. Besides white cedar ties from the woods of Maine and New Brunswick there are smaller lots of chestnut, oak, tamarack, and hemlock sent down.

One of the greatest innovations in recent years has been the trade in Southern pine trees. An immense business has developed in the South in cutting and shipping railroad ties to various parts of the country. These pine ties are both hewn and sawn, and they are shipped north in immense quantities both by rail and boat. The pine ties do not last as long as oak or chestnut, but they are cheaper, and the supply seems almost inexhaustible. It is probably the discovery of the value of the Southern trees for making railroad ties that prices have been kept down in recent years. In some localities ties are actually cheaper to-day than they were five, ten or fifteen years ago.

Preparation of Rubber from the Leaves of the Rubber Tree.

The French consul at Singapore, M. Jouffroy d'Aabns, in his report lately presented to the Minister of Commerce at Paris, gives some interesting information relating to the rubber industry as carried on in that region, and especially that relating to a new process for its extraction from the leaves of the rubber tree.

Experiments have already been made in this direction within the last few years, and a new industry has thus arisen. The leaves of the rubber tree, principally that variety known as the Isoandria Hookerii, are exported in the dry state from Singapore, Sumatra, Borneo, etc.

They are pressed into bales of 150 to 200 kilogrammes and sent to factories in Europe, one of which is at Brussels, another at Orleans, France, and a third near Paris. In considering the question, M. d'Aabns concludes that it is not probable that a good quality of rubber is to be obtained by the process of treating the dry leaves, for the following reason. Being a vegetable gum of extreme sensitiveness, it is subject in its natural state to modifications and changes of structure upon a prolonged exposure to the air. This oxidation, in the case of the gum or the leaves containing it, is carried on rapidly upon contact with air, and in consequence its durability and solidity are diminished, and many of its most valuable properties are lost. It thus becomes of little value as an insulator for wires or cables. Thus the gum extracted from the dry leaves is of an inferior quality, and especially so, as the European works treat these leaves by chemical processes, all of which tend to destroy its structure. The product so obtained may, indeed, be used for various purposes where a first-class quality of rubber is not required.

The question then arises whether or not it is possible to obtain rubber of the best quality by treatment of the leaves. This problem has been studied for several years at Singapore, under the supervision of the French government, but, until recently, without success. It has been found that the leaves must be treated while green, and by other than chemical processes in order to avoid oxidation and changes in structure. This problem has at last been solved by M. Ledboer, formerly professor of physics at the Sorbonne, and his process is eminently practical and easily worked on a commercial scale. M. d'Aabns has visited his plant and has seen the process of extraction of rubber from the fresh leaves carried on with success. The inventor has recently made a contract with a large company—the English Extension Company—for the use of his process, and a Dutch company has lately been formed to carry out the process in a part of the Dutch East Indies.

As the collected fresh leaves should be treated on the spot, to avoid the bad effects of drying, the plant must be in the neighborhood of the forest. It has been found that the rubber plant may be cultivated, and plantations formed which will yield a good product of leaves in their fifth year, while, on the other hand, the trees do not furnish sap by boring until their fiftieth to seventy-fifth year.

It is estimated that a suitable plant could be installed for about $30,000. This may easily be erected under the supervision of an engineer with the help of native labor.

During the first five years, while waiting for results from the plantation, leaves could be obtained by contract with the natives, who would collect them in the forests. After five years, an important production of leaves from the plantation would furnish an addition to the total, and after ten years the plant would be entirely independent of the natives, the whole amount of leaves being obtained from the plantation. A large company is now in formation at Rotterdam, which will, no doubt, secure a monopoly for the Dutch possessions in Borneo and for Sumatra. It is estimated that the annual exportation from these regions equals 3,000 tons.

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Science Notes.

At a recent flower show in England some sweet pea vines were exhibited which were grown from seed taken from the tomb of an Egyptian mummy buried some 2,000 years ago. The blossoms were of a delicate pink and white and were less than the ordinary size.

Mr. Spencer, an aeronaut, together with a companion, left the Crystal Palace, near London, and landed between Treport and Dieppe, France, on July 29. In crossing the Channel they were obliged to throw out everything to prevent their falling in the water; even their anchor was abandoned. The balloon then attained an altitude of 12,000 feet.

A Chilean snake charmer was recently bitten by a Gila monster while giving a performance at Coney Island. The wound was dressed by a doctor, who tied a tight bandage about the wrist, drawing out the poison. The snake charmer had tied a tight compress about his thumb. This probably prevented the poison from spreading through the system, and undoubtedly saved his life. The bite of one of these snakes usually results fatally.

There is one department of the municipal government of New York which does not cost anything and into which politics do not enter. This is the Municipal Art Commission, which passes upon the artistic merits of all paintings, statuary and other works of art offered to the city. The commissioners serve without salary and they are their own clerks. They pay no office rent, meeting at their offices and houses. Owing to a wise provision of the new charter, the Mayor is compelled to select the members from a list prepared by an association of art societies called the "Fine Arts Federation," so that it is strictly non-partisan.

A large percentage of the flowers which are exhibited at horticultural shows show the results obtained by crossing different varieties, so the deficiencies in one may be made good by the virtues of another. The Department of Agriculture is studying how to obtain orange trees that possess greater hardiness, and at the same time produce a delicious fruit. Their efforts have been crowned with success. The sweet orange was crossed with the Japanese orange, which resulted in the production of a hybrid that is much hardier than the ordinary sweet orange. The department is also experimenting with crossing sea island cotton with upland cotton, and the pineapple has also been the subject of experiment.

It seems we have at last aseptic dueling. According to The Medical News, in a recent Paris duel, whenever the sword of one of the gentlemen who sought this foolish manner of settling their differences touched the ground, the duel was instantly interrupted until the blades were thoroughly sterilized by passing through the flame of an alcohol lamp. What is specially feared is that the swords may become contaminated with the bacillus of tetanus. A French surgeon has issued a book giving regulations for the proper conduct of a surgeon when summoned to a duel. The most rigidly surgical sterilization of the dueling swords is recommended, and their careful preservation in the state of most absolute asepsis until they are handed to the duelists.

For the first time the Census Bureau is to have a home of its own. Heretofore it has been impossible to accommodate under one roof the clerical force required to perform the great amount of work involved in taking the census. At the 1890 census it was necessary to occupy nine or ten buildings in different parts of Washington in order to find office room for the clerical force. The new building will cover two acres of ground, and will be situated at the corner of First and B Streets, N. W., Washington. The main building will be one story high; the administrative will be two stories. The building will accommodate a force of clerks numbering 2,000 to 2,500. A considerable portion of the space available will be needed for printing. The building will be of brick, plain but substantial. It is expected that the building will be ready for occupancy soon after the first of January, 1900.

Notwithstanding the very severe edicts which have been passed in Italy to keep masterpieces of art from being alienated, the "Chigi Botticelli" was recently sold for $63,000. Under the Pacca edict the picture could not be sold by auction. The result was that Prince Chigi held an informal "sale" at his house, in which there was no auction, but merely a "competition" among buyers to see who would offer the most. It is difficult to see where is the distinction. According to law, the purchaser sent his card to the Ministry of Public Instruction, stating that he was the purchaser of the Botticelli. The officials informed him that his declaration must be made on stamped paper. The buyer complied with these conditions, but all the time the picture was traveling toward the frontier in the bottom of a trunk. It was found that the visiting card was false and that the document on stamped paper was also false, and the buyer has not been heard from since. Signor Baccelli is a good executive, and will undoubtedly make trouble for some one for this scandalous transaction.

Engineering Notes.

The American Line steamer "Paris" left Falmouth on August 14, under her own steam.

Emperor William visited Dortmund on August 11, and opened the Dortmund-Ems Canal.

A De Laval steam turbine motor has been used in a slate mine for running a ventilating plant. The high speed of the turbine is reduced by means of proper gears, so that the actual speed of the fan is about 1,000 revolutions per minute.

Notwithstanding an increase of the outputs of all products of Baku, Russia, about 200,000,000 gallons of petroleum in a total of 2,000,000,000, the average whole output per well has fallen from 225 gallons in 1896 to 199 in 1898. This would apparently indicate a permanent weakening of the wells.

The British steamer "Puritan" sailed from Philadelphia on August 12, with a large cargo of railway materials, in fact the largest cargo that has ever been taken from any port of the United States. She took out forty Baldwin locomotives and tenders, and eighteen steel bridges for the Chinese Eastern Railroad, in addition to several tons of miscellaneous cargo. Another steamer will leave in a few weeks with a similar cargo.

The number of failures from all causes in automatic block signals as compared with the total number of movements of each signal does not exceed more than one in 30,000, says The Railroad Gazette. In case of failure of a signal it causes a stoppage of the train until the cause can be ascertained. The failures which are entirely erroneous, that is to say, which make a signal show safety when it ought to show danger, are less than one in a million movements. This is a far better result than can be obtained from any system of block signals depending upon human agency.

The Navy Department has received from the agent of Vickers & Maxim, of England, reports of the trials at the company's proving ground of the new 6-inch quick-firing gun and mounting manufactured by the company for the navy. This gun was ordered by the Chief of Ordnance of the Navy a year ago. In the recent trial a number of charges of cordite were fired with very satisfactory results. The rate of ten rounds per minute was obtained. This gun has been adopted by the British Admiralty, and the United States recently purchased the right to use its mechanism.

The Gruson Iron Company, of New York, which was recently incorporated, has acquired the exclusive right in the United States to manufacture chilled cast iron rotating turrets and other chilled armor construction for coast defense and also all the rights for the manufacture of port gun carriages and all machinery connected therewith. According to the contracts, the German allied firms of Krupp and Gruson are to furnish all possible information and experience required in the process. A large plant will be constructed at some point which has not yet been determined upon.

Workmen who are engaged in digging a trench in Park Row, New York city, in front of the Federal building, have unearthed a section of the first water main ever laid in the city, being one of those put down by Aaron Burr's company. Clay pipes were at first used, but the expense of their manufacture was so great that they could not be used, and chestnut logs were substituted. Those which have been unearthed were found to be in good condition. We have on another occasion described the interesting water tank by which Aaron Burr's banking company obtained its franchises.

Bearing on the question of standardization is the uniformity in screw threads, and Continental papers are now referring to the success of the movement inaugurated in 1895 and concluded last October, with regard to the Continental solution of what had been a great difficulty. Last winter a conference of representative machine makers of France, Italy, Switzerland, and Germany was held at Zurich, when it was agreed that gages and threads should be stipulated in millimeters instead of the English inch, and we now learn that the plan is proving most acceptable. Hence another reason for the adoption of the metric system by the engineers and manufacturers of this country.—Industries and Iron.

Five hundred men were discharged from Cramps' ship-yard, Philadelphia, on August 15, and last week 300 were also discharged. It is not on account of lack of work, but lack of steel, and it is likely that 1,500 more will be dropped within a week. There are large quantities of material at the yard but it does not come in the order which is required for use. Several ship-yards on the lakes have had to close entirely because they cannot get the steel they want. Of course, ship-building does not make any great draft upon the steel product of the country, for it is estimated that only about three per cent of the steel manufactured goes into ship-building. The Pressed Steel Car Company, which requires one thousand tons of steel a day, cannot get more than six hundred tons. All of the steel mills are far behind in their orders, and it will take some of them many months to fill their orders.

Electrical Notes.

In some places trolley companies are cultivating strips of lawn between the tracks, producing a most pleasant effect. The Electrical Review remarks that grass in the streets is now a sign of progress rather than of retrogression.

A South Side church in Chicago has a steeple on which arc lights are placed. The lamps are 225 feet above the level of the street, and, as it might be imagined, produce an excellent effect and serve to effectually advertise the church.

A correspondent informs us that on the Milwaukee-Waukesha electric line air brakes and air whistles have been used with much success. The distance of twenty miles is made in fifty-five minutes, so that there is need for effective brakes and whistles. We noted a short time ago that they were to be applied on the cars between St. Paul and Stillwater.

There are two electric tramways in operation in Holland. One is from Vaals on the German frontier which is only half a mile in length, and the line from The Hague to Scheveningen is somewhat over six miles. The cars are actuated by accumulators, as the trolley system is forbidden. Holland is a country of short distances, and it ought to be an ideal location for tramways.

The Baldwin Locomotive Works, of Philadelphia, have recently constructed two electric locomotives for the Imperial Government of Japan, where they will be used in the coal mines. These are the first engines of the kind which have been exported from America. Their height from the rail, exclusive of the trolley, is 2 feet 10 inches; width, 4 feet 2 inches; length over end bumpers, 11 feet 8 inches. The locomotive complete weighs 12,050 pounds, and is of twenty horse power. It has a speed of 8 miles per hour.

In Germany electric plowing compares favorably with steam plowing as regards expenses. The cost of electric plowing in heavy soil with deep cultivation is from $11.25 to $14.25 per acre, while steam plowing costs $21.25 per acre. The mechanism used on the royal farms in Prussia consists of a motor wagon containing a motor driving the winding drums, and the motor may also be coupled to the driving wheels of the wagon to give it the proper advance at the end of each traverse of the plow. The depth of the furrow is 8 to 10 inches and the speed of plowing is about 3 feet per second.

We have already referred to the offer of President C. J. Glidden of the Erie Telephone and Telegraph Company of a million dollars for a telegraph repeater and telephone quadruplex. He has received a large number of letters, and he states that many persons have entirely misunderstood the offer, and inferred that the sum is to be set aside to be used by inventors to assist them in their efforts to produce such a device. The offer is, however, only for a perfect device fully covered by United States patents which are to be assigned, the instruments when used on telephone circuits to produce the same results, telephonically speaking, as the telegraph repeater and quadruplex in the workings of the telegraph circuit.

Some interesting experiments were recently carried out at Newbury, England, in wireless telegraphy and by means of the Hertzian waves. According to The English Electrician, the first experiment consisted in blowing up a miniature powder magazine at a distance of 400 yards. A balloon fitted with wireless signaling apparatus then made an ascent and continuous signaling was carried on between the balloon and the ground. Small cartridges of guncotton suspended from the balloon car were also fired from the ground when the balloon was a long distance away. These experiments demonstrate that the explosives can be readily fired at a considerable distance by means of Hertzian waves, and secondly, with proper precautions, wireless signaling can be carried on in the neighborhood of such explosives, even though they are in a condition to be fired by more Hertzian waves than those used for the signaling. The experiments are not regarded as of much value by another English electrical journal.

Electricity would be a great advantage to the farmer if it could be readily obtained, and it would be interesting if some farmer of means would install a fine electric plant. Of course, it is useless to expect that the majority of the farmers will ever adopt any electrical plant, owing to the very large expense of such installation. Electricity would prove very useful in plowing, and many experiments have been made, but little has been done except to substitute electricity for steam power in connection with machine plows already in use. Where electric power is available, it is possible to install at a moderate cost a system of light railways connecting the various buildings and fields, so that most of the hauling can be done by power. In stacking hay in large barns electric power would prove very useful. Machinery around the farm is usually distributed at a number of points, for instance, hay cutters will be in one place, pumps in another, etc., but with electricity at hand, all the machinery can be run by isolated motors.

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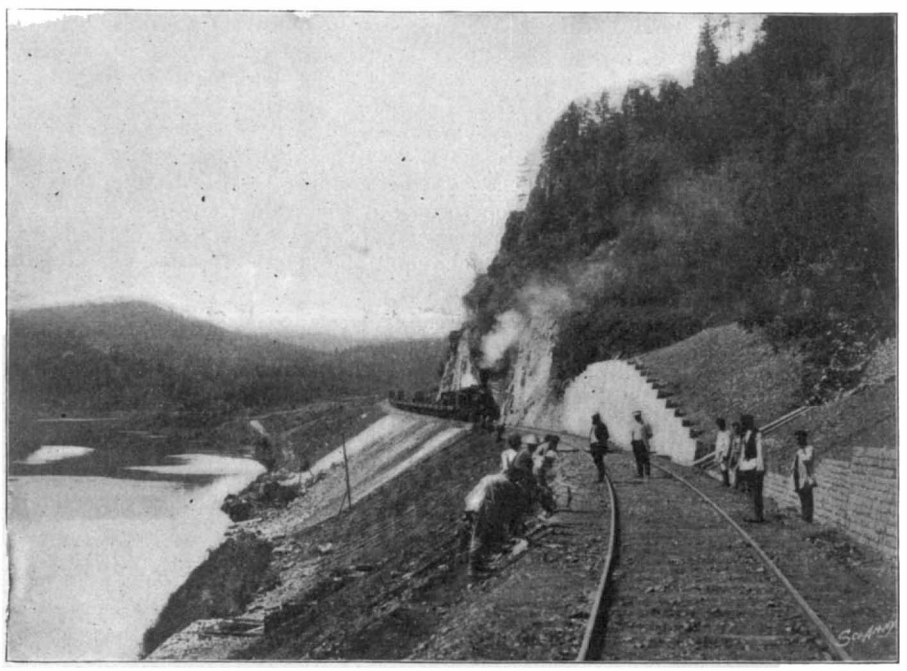
THE TRANS-SIBERIAN RAILROAD.

BY HENRY MICHELSEN, SECRETARY NATIONAL IRRIGATION CONGRESS.

The results of the operations of the Trans-Siberian Railroad for the year 1898 are said to be encouraging to the Russian government. In its present unfinished state the traffic must be strictly local. An analysis of the government report shows that the country through which the line runs, though at present undeveloped and subject to the rigors of the climate on a prairie sloping to the Arctic Sea under the fifty-first degree of latitude, is still capable of producing great crops of grain; that it has fine forest resources, that live stock may flourish in it, and that coal has been found sufficient for the purposes of the railway and the population which may settle on the lands contiguous to it. Therefore, the railway may be expected, when finished, to become a factor in the commercial business of the world, even if its through traffic is not considered, by the opening up of the riches of the hitherto unknown continent which it is destined to make accessible.

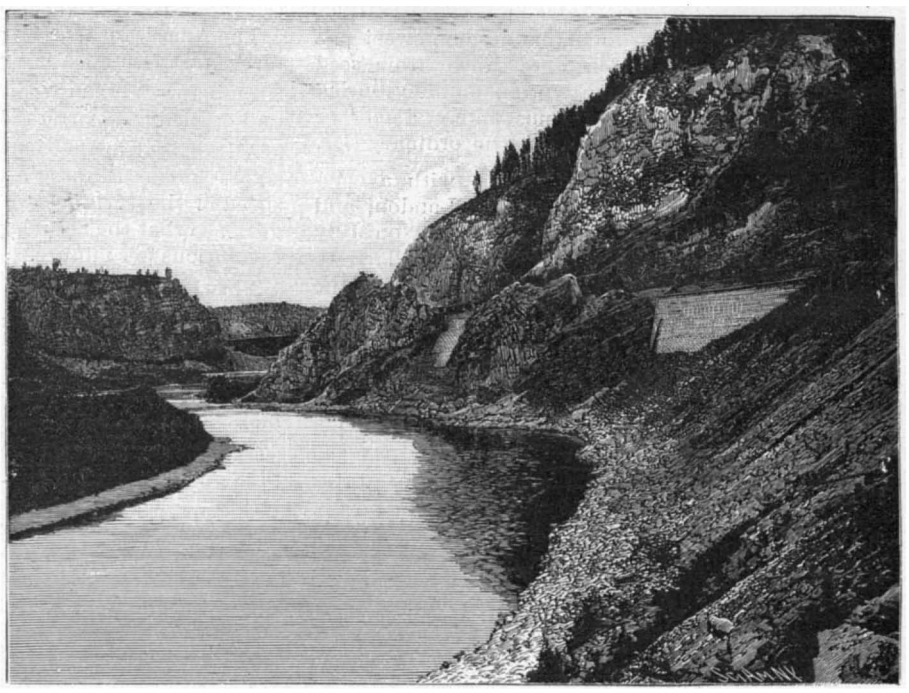
The length of the road with its projected extensions is so great that even Americans, who are accustomed to deal with large distances, will have some difficulty in comprehending the scope of this undertaking. The longest continuous line on the North American continent is the Canadian Pacific Railway. Its main line from Montreal to Victoria is 2,990 miles in length. The located line of the Siberian railway, from Cheljabinsk to Vladivostock, is 4,776 miles; the branch through the recently acquired territory of Manchuria to Port Arthur will be 1,273 miles; so that the system will commence, before any feeders are built, with 6,000 miles of track. The distance from Vladivostock to St. Petersburg will be nearly 6,700 miles. The distance from Port Arthur to the harbors of the North Sea, on the estuaries of which the European trade with Eastern Asia is centered, is, approximately, 6,900 miles by the nearest route.



On the Banks of the River Simm, near the Miniar.

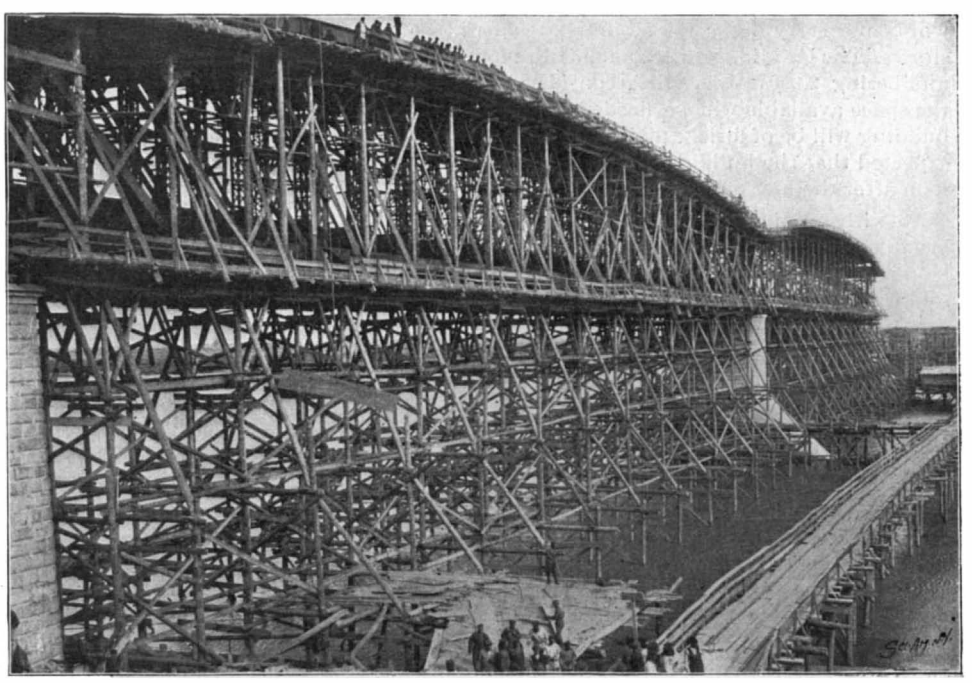
The Siberian Railway is, like all Russian roads, of a five-foot gage. It is constructed after the manner of American Western railways, single-tracked, gravel-ballasted, where ballasted at all, with Howe truss bridges over the smaller waterways, and steel bridges across the large rivers. The watershed of the country east of the Ural Mountains is from south to north for more than 3,000 miles, which means a northern exposure entailing more severity of climate than is known on the railways of the United States and Canada. The rivers here are deep, full flowing streams, the alluvial bottoms of which necessitate large spans and make it desirable to have as few bridge piers as possible. Floating ice is in the rivers for about seven months of the year. The bridge at the Ishim has openings amounting to 700 feet, that at the Tobal 1,400 feet, that at the Irtish 2,100 feet; and the bridge over the Yenesei has a total length of just under 3,000 feet. Lake Baikal is traversed by a steam ferry for a distance of some forty miles. Forty bridges, each over 200 feet long, cross the tributaries of the Obi River between Omsk and Irkutsk. East of Baikal the road passes into the valley of the Amoor River, bridging waterways running from north to south. After spanning the Amoor at Khabarovka by a steel bridge some 5,000 feet in length, it turns abruptly to the south toward Vladivostock, running to the east of the rivers skirting the Khenden-a-Lin Mountains. The total length of water crossings between Cheljabinsk and Vladivostock is given at 30·1 miles exclusive of the forty miles of ferry; the snow sheds and fences at 565 miles.

The western section extends from Cheljabinsk on the European frontier to Pochitanka, 1,080 miles. It runs for 880 miles over a highland plane so level that the distance exceeds an air line by only 2½ per cent. There are tangents on this division of 50, 62, and 86 miles. For fully 600 miles the line traverses an excellent agricultural country, producing all kinds of grain in abundance. The 300 miles west of Tomsk run through a fine stock country containing many small lakes of slightly brackish or alkaline water; 200 miles east of the main stream of the Obi River the country is hilly, heavily timbered, and cut up by many small streams. The central division commences at Tomsk and extends to Irkutsk, through a barren upland, climate and soil alike forbidding settlement. The third section crosses the Baikal Lake, and extends to Misorskaia. From this point to the Amoor section, the road passes its summit to drop down into the Pacific slope, running along the old Chinese frontier, touching Kiahta—the emporium of Russo-Chinese overland trade—through a country rich in gold, silver, copper, and iron, producing even now, with antiquated machinery, some fifteen millions of dollars worth of gold annually. The Amoor section extends eastward toward the Pacific, approximately 1,600 miles. This is the district from which the greatest returns may be expected agriculturally. It is well timbered, contains large bodies of alluvial lands and its climate is tempered by the proximity of the Pacific Ocean. The next, the Ossoori section, extending southward to the terminus at Vladivostock, runs through a hilly country fit for agricultural and stock raising purposes, and rich in excellent bituminous coal. The branch which runs through Manchuria passes through a thickly settled farming country; it leaves the Khingan Mountains to the west and crosses the many streams flowing into the Soongaree River, reaching the fine harbor of Port Arthur, which, being ice free the year around, will, it is safe to say, rival Hong Kong at no distant day. Port Arthur is destined to become the great city of Siberia. The fertile territory tributary to the Siberian Railway proper is equal in size to Germany, Austria, Belgium, the Netherlands, and Denmark combined. This territory is capable, if once peopled, of sustaining a railroad out of the local traffic it will produce. The long stretch of 1,500 miles extending from Tomsk to the head waters of the Amoor is perhaps the only distance on the line of the road which a Western railway man would consider difficult to handle successfully as regards revenue. But this upland country has not been explored, and there is a possibility of its becoming a mining country of great importance.



The Railroad Along the River Zouriazan.

The transportation problem of the Trans-Siberian Railway is a peculiar one. The products which it may expect to carry are what Americans would call low-grade freight—grain, ore, live stock, and timber. To transport these articles from the interior of Asia to the markets of the world must entail too long a railroad haul. It may be pointed out that California wheat is carried from San Francisco to Liverpool via Cape Horn, not all rail by way of New York. In general it may be held that agricultural staples cannot stand a railroad haul of over 2,500 miles. The greater part of the import and export trade of Eastern Asia is in the hands of the western European nations, taking its way through the Suez Canal. The schedule time of the North German Lloyd's steamers between Bremen and Shanghai is 46 days. Its tariff rates are less than $6 per ton or cubic meter of room to Shanghai or Port Arthur, $6.25 to $8.75 to Yokohama and Hiogo, and $8.75 to $11.87½ to Nagasaki. Between London, Liverpool, and other English harbors and Asiatic points, the freights are a little less than is charged to and from German ports. This means, practically, that in the competition for through freights, the Trans-Siberian Railway may not cope with the steamship lines to Europe, either in rates or time. For, assuming the adoption of the European classification, with its tariffs running from 0·47 to 2·35 cents per 1,000 kilogrammes per kilometer, we have a rate per ton of the lowest grade of freight for 7,000 miles of over $200, which is prohibitory. As to the time, we must consider the necessity of a transfer from the Russian five-foot gage cars to the standard gage cars at the European frontier, and also the physical condition of Russian railways in general. Railroad men will concede that on crowded, single-track Asiatic railways a freight train will do well if it makes 240 kilometers, or 150 miles, a day, for many consecutive days, taking into consideration the liability to accidents, delays by reason of accumulated traffic from opposite directions, and the uncertainties incident to an Arctic climate. At any rate, this is the standard adopted by other Russian roads, of which Mr. Poultney Bigelow says that "an express train means a train that does not carry cattle and occasionally attains a speed of 25 miles an hour," and where the adaptability of the inferior administrative officials to the requirements of modern railway service has not, as yet, been demonstrated. The time, therefore, between Vladivostock and Hamburg, under present conditions, will be about the same either by rail or steamer, with the advantage of uninterrupted passage and fragmentary rates in favor of the latter. For east bound freights from the interior of Asia to the United States or Canada there will be but little



West Siberia Railway—Bridge Over the Irtish.

THE TRANS-SIBERIAN RAILROAD.

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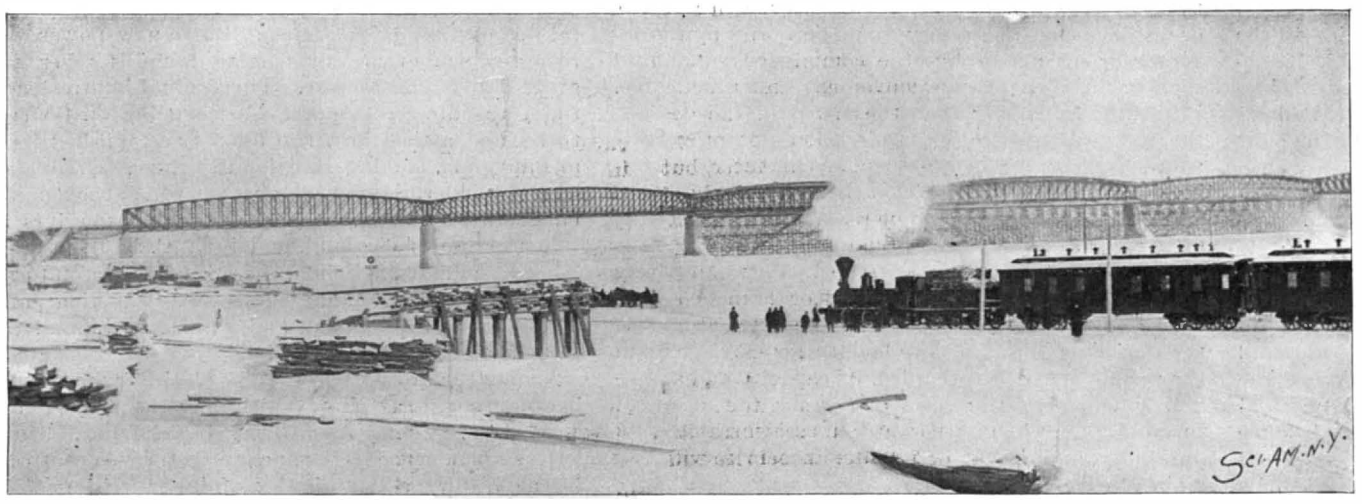


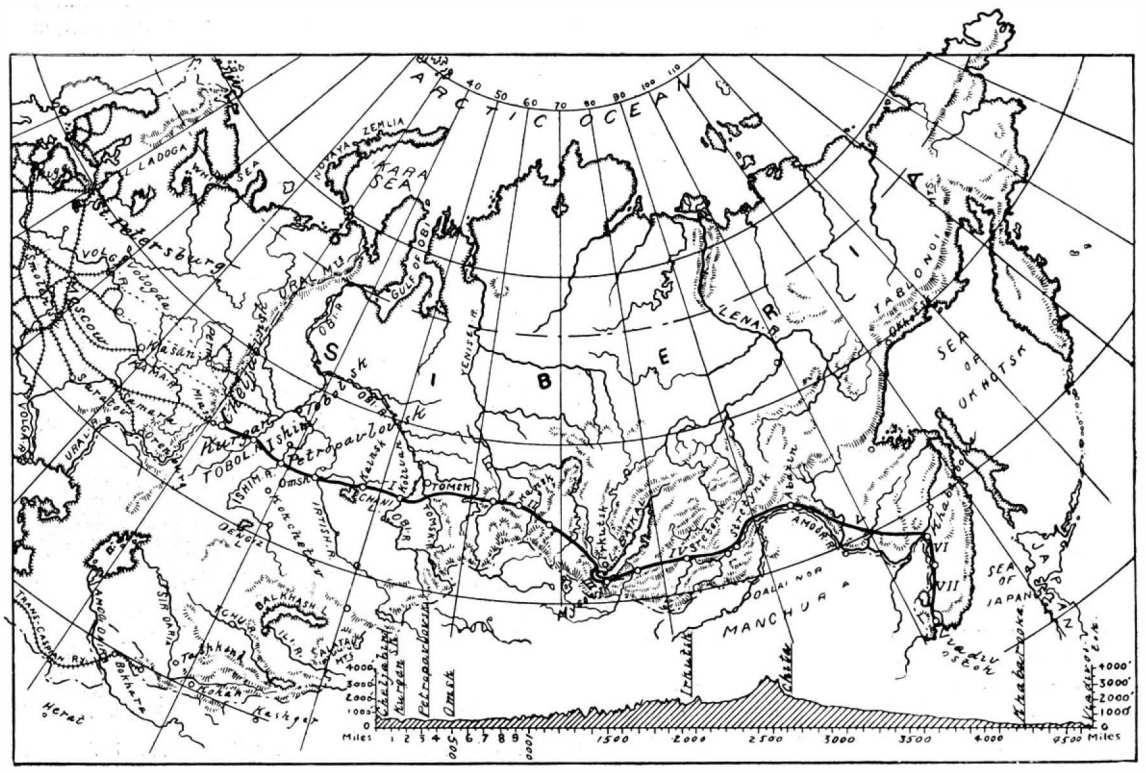
Movement of Trains on the Ice near the Bridge over the River Irtish.

demand. Siberia, Canada, and the States of the Union raise products of the same kind, making an interchange unlikely to occur. We are therefore bound to assume that if the Siberian Railway is to earn its expenses at all, it must rely upon its local traffic almost exclusively. This can only be made possible by the introduction and establishment of a new population, both agricultural and manufacturing, originating beyond the old limits of the empire into the territory traversed by the road. Now this population is close at hand It does not have to cross broad seas, as did the immigrants that built up the United States. The time is big with events in the Far East. The close of the century witnesses the breaking up of the greatest of old world industrial nations, the empire of China, and Russia will fall heir to whatever it may choose to take, both as to Chinese population and territory. So far from imitating American anti-Chinese legislation, Russia favors the immigration of its newly acquired subjects into the Siberian provinces.

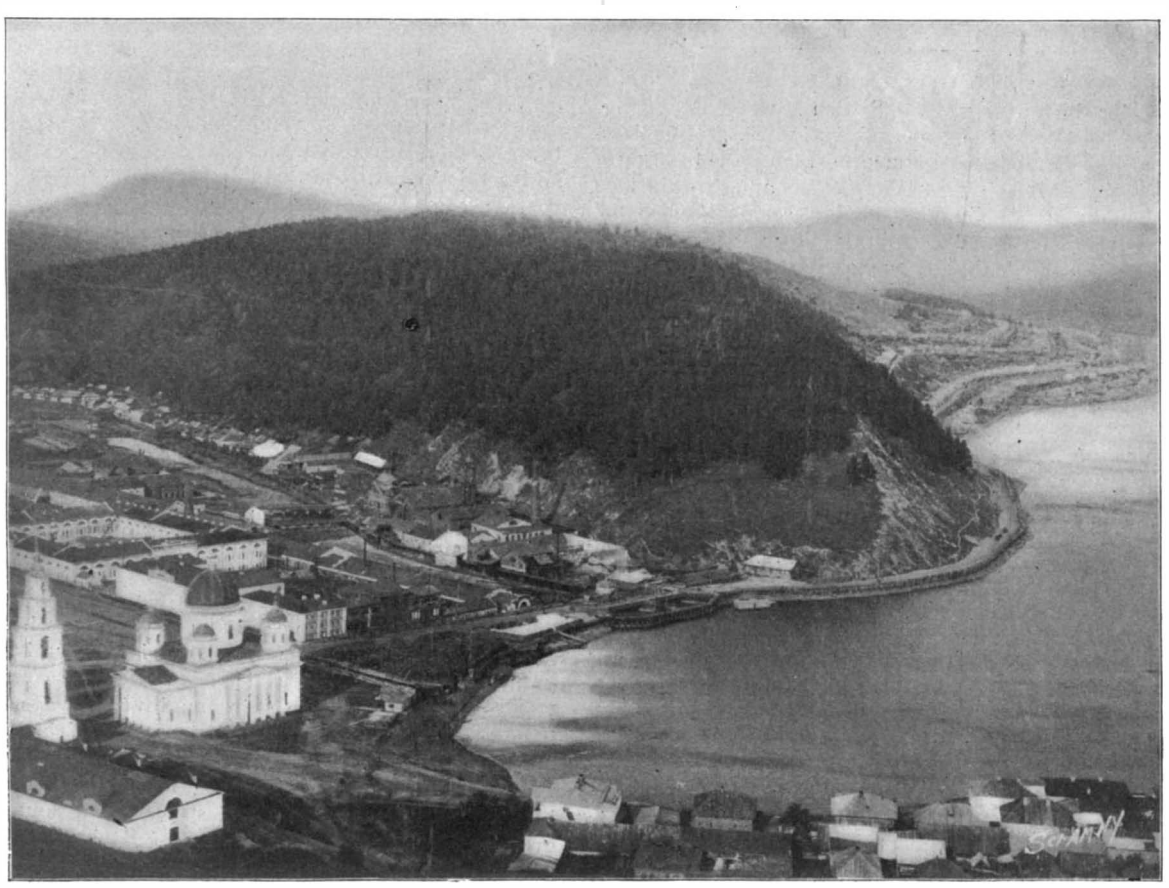
The "spheres of interest" in China, at present, stand thus:

ITALY.		
Tokien and Che Kiang		72,630 square miles.
GERMANY.		
Shantung		65,104 square miles.
FRANCE.		
Kwang Se	78,250 square miles.	
Kwang Tung	79,456 " "	
Quei Chow	64,554 " "	
Yunnan	107,969 " "	
		330,229 square miles.
GREAT BRITAIN.		
Kiang Su	44,500 square miles.	
Kiang Se	72,176 " "	
Ngan Hoe	48,461 " "	
Honan	74,320 " "	
Hoo Peh	70,450 " "	
Sgetchuen	166,800 " "	
		476,707 square miles.
RUSSIA.		
Mongolia	1,500,00 square miles.	
Manchuria	400,000 " "	
Pe Chili	58,949 " "	
Kansuh	86,608 " "	
		2,045,557 square miles.

The Chinese, as known to the citizens of the United States, are a frugal, intelligent, hardworking race. As irrigators and fruit farmers they are unequaled; as miners, both in placer and fissure mining, wherever they have been permitted to work, they have excelled. For the development of such a country as Southern Siberia they will be found eminently adapted. They are imitative to a degree, docile and obedient, and will make excellent factory hands. We conclude, therefore, that a railroad having farming, mining, and manufacturing prospects like those enumerated above may be supposed to have reasons for anticipating a successful issue of its financial affairs.



Map Showing Route of the Trans-Siberian Railroad.



Ironworks of Miniar.

THE TRANS-SIBERIAN RAILROAD.

The mere construction of a line of railway extending communication between the ports of the Pacific and those of European Russia would have been comparatively an easy achievement. The builders of the road had immeasurably more than this to accomplish. They had to make a scientific exploration of half a continent, to drain swamps, utilize peat bogs for fuel, lay out irrigation ditches, dig wells, provide for the housing, feeding, and health of incoming settlers and their animals, to erect school houses, bring in agricultural teachers to show the immigrants how to plant, water, and raise crops fitted for soil and climate, make country roads and bridges, arrange rural mail facilities, and a multiplicity of other things about which an American railroad man has not to think. The construction of the railway led to the rectification of navigable streams for the shipment of material, to the sinking of shafts to obtain iron and coal, the laying out of villages for the workmen, the erection of machine shops, plants for the manufacture of cement, and technical schools for railway employés. For purposes of construction it was necessary to examine the mouths of the great rivers flowing into the Arctic Sea, to explore Lake Baikal and place buoys in its channels. The "volunteer fleet" was increased by three great ocean steamers, and railway connection was built to the port of Archangel on the White Sea.

In the Trans-Siberian Railway we have a magnificent exposition of well considered and ordered human endeavor. No one will want to contend that in the accomplishment of so stupendous an enterprise all mistakes have been avoided; but the effort is a noble one, and worthy of the great nation which has undertaken the task.

The above is a resume of a lengthy article, the full text of which will be found in the current issue of the SUPPLEMENT.

DURING the administration of the receivers of the Baltimore and Ohio Railway, 15,350 box cars, 6,750 wooden gondola cars, 6,000 pressed steel cars, 310 miscellaneous cars, postal, express and dining cars, were purchased, at a total cost of $17,000,000. Two hundred and sixteen locomotives were purchased at a cost of nearly $2,500,000. The steel rail purchases amounted to 123,010 tons, costing $2,142,000, an average of about $17.50 per ton. The number of cross ties purchased was 3,000,000 at a cost of $1,200,000, and the number of cubic yards of ballast 750,000, at a cost of $525,000. The cost of new steel bridges was $750,000, and the cost of improving terminals, erecting new buildings, reducing grades and changing alignment, about the same amount. The maintenance of way department expended, as wages, for improvements, nearly $12,000,000. The total of all the expenditures was about $35,000,000. —Railway Review.

THE celebrated French sculptor M. Rodin has obtained permission to make an individual exhibit at the coming Paris Exposition. The works of M. Rodin have been the subject of so much controversy recently that he wishes to present them as completely as possible, and for this reason the municipality has allowed him to have a site for a special exhibition.

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The Pollok Memorial Prize.

The Department of State has given notice to the various governments of the "Anthony Pollok Memorial Prize," to which we have already referred on two occasions. According to this notification, Mr. Pollok's name is prominently connected with many of the most important inventions of the last half of the nineteenth century, and he will always be remembered as a potent factor in the development of the patent system. The document states:

"He cherished a dream of universal patent practice embracing all nations of the world, and inspired in France the first step toward its realization in the International Convention for the Protection of Industrial Property, of which he was vice-president. When the United States at first withheld its adherence, he aroused the interest of manufacturers, and appeared twice before the Committee on Foreign Affairs of the United States House of Representatives, answering objections and advocating the measure in printed briefs and oral arguments, finally attained the object of his efforts.

"With sorrowing hearts and profound regret those who loved him, and deplored his loss, have founded this prize in sacred remembrance of their affection, and as a crowning monument to honor and perpetuate the memory of Anthony Pollok."

The prize consists of one hundred thousand (100,000) francs ($20,000) and is to be awarded to the inventor of the best apparatus for the saving of life in case of maritime disaster and is to be open to universal competition. This sum is on deposit with the American Security and Trust Company, of Washington, D. C., and will be paid over to the successful competitor when the decision shall have been rendered by the appointed jury and formally communicated to the Secretary of State of the United States through the Commissioner-General of the United States to the International Exposition of 1900. The juror selected on behalf of the government of the United States is Lieut. William S. Sims, U. S. N., Naval Attaché of the Embassy of the United States at Paris.

The Committee of the Pollok Memorial Prize has formulated rules and regulations which will be subject to revision by the Jury of Award in Paris, but it is not anticipated that any material change will be made, and should such changes be made, notice will be given to the applicants.

We give below full text of the rules as issued, and for further information our readers are requested to address William Ker, Secretary, 1405 G Street, Washington, D. C.:

"The jury shall have power to dispose of the prize in the following manner:

"First. It may award the entire amount of 100,000 francs to one person submitting the best original apparatus or device for the saving of life in cases of disaster at sea, provided it is, in the opinion of the commission, of sufficient value to the world to justify the award.

"Second. In case two or more persons shall submit devices which seem to the jury to be of equal or nearly equal value, there may be awarded to the several inventors thereof such a ratable proportion of the entire sum as the commission may deem just; or

"Third. In case none of the devices presented shall be deemed by the jury of sufficient value to justify the giving therefor of the prize offered, the jury may reject all, but may reimburse any competing inventor for his expenses, wholly, or in such part as it may judge proper.

"The jury will make all necessary rules and regulations for its government and procedure not inconsistent with the conditions herein stated.

"Instructions to Competitors.—Persons desiring to compete must comply with the following instructions:

"Each competitor shall submit a working model of his apparatus or device, together with accurate scale drawings, full size when practicable being preferred, but drawings to a large scale will be accepted. These must be accompanied with a statement in writing containing the following information concerning the apparatus or device:

"First. Name. Second. Detailed description. Third. Nomenclature of each separate part, stated in list form with reference letters corresponding to letters on accompanying drawing. Fourth. Construction, stating method of manufacture or fabrication in detail. Fifth. Kinds and quantities of materials used in construction. Sixth. Dimensions of all parts. Seventh. Weights of principal parts, and total weight of apparatus or device. Eighth. Description of method of using. Ninth. Claims of inventor for device, set forth specifically, in full, and in numerical order. Tenth. Whether device or any of its parts is covered by letters patent or caveat in any country. If patented, in what country or countries, giving registered number or numbers of patent or patents. Eleventh. Estimated cost at which it may be furnished. Twelfth. Whether it has ever been actually used or tried? If so, when, where, and with what results? Thirteenth. All devices submitted must be delivered at the expense of the inventor or agent at the time and place appointed, and returned at the expense of said inventor or agent when no longer required by the jury. Fourteenth. All expenses connected with the trial and testing of the apparatus or device, if trial or test be deemed necessary, shall be borne by the inventor or his agent, but the commission will afford such facilities as may be convenient and practicable. Fifteenth. In passing upon the merits of the devices, the jury will take into consideration not only their values as preservers of life when once in the water, but in case of appliances which depend upon the aid of persons other than those to be rescued (such as boats, rafts, etc., as distinguished from life preservers and the like), it will take into account the facility and safety with which they may be detached or launched from the vessel under any conditions. The extra weight of the device or apparatus, its facility for carriage upon the vessel, the space occupied, its capacity and adaptability for carrying numbers of persons, the means of sustaining life when in the water, its seaworthiness, its durability, and its cost of maintenance in service will all be considered.

"The competition will also include devices designed to save life by preventing a vessel from sinking at sea as the result of collision with another vessel, an iceberg, or other object. The foregoing requirements, so far as applicable, must be complied with by competitors."

A TOKEN OF APPRECIATION.

From time to time we receive kind words from our subscribers relative to the Scientific American, and we highly appreciate all such tokens of interest. We were indeed greatly surprised to receive, a few days ago, a gold medal, which was presented to us by Mr. T. R. Bowman, of "Waverley," South Terrace, Adelaide, South Australia. His letter is as gratifying in itself as is the handsome medal.

He says: "I forward this trifle to the Editors of the Scientific American as a souvenir of thanks for the many favors, information, and instruction I have derived from the perusal of the Scientific American for the last twenty-seven years; also for your kindness in giving me at different times information by letters."

The medal itself measures 1⅜ inches in diameter, and consists of a plain gold ring, which circumscribes another gold ring of a differently colored gold. The

MEDAL PRESENTED TO SCIENTIFIC AMERICAN.

second ring is deeply chased; then comes the medal itself, which was executed by F. Basse, jeweler to His Excellency the Governor. The obverse has a heraldic design bearing the words "Advance Australia," and the date, "1899. On the reverse are the words "Messrs. Munn & Co., Scientific American, New York, from T. R. Bowman, South Australia."

Kind words are always encouraging, and Mr. Bowman's thoughtfulness in sending the medal is much appreciated.

Royal Letters from Babylon.

Under the auspices of the British Museum, Mr. King, of the Department of Oriental Antiquities, has collected a series of ancient documents which have been published under the title of "The Letters and Inscriptions of Khammurabi, King of Babylon, about B. C. 2200." A few years ago the dark hiding place of Dier-el-Bahri yielded up the bodies of the greatest of the Egyptian Pharaohs, and in February of this year some more of these august rulers of Nile land were recovered at Thebes. But it is in the field of Oriental literature that the greatest of our recent discoveries have been made. Nothing has been so astonishing as the universality of the literary remains. It is not only royal records, or a few votive inscriptions, telling us, in grandiloquent terms, the mighty deeds of some Babylonian or Egyptian ruler, that have been brought to light. The literature of these records of the past is far more extensive and wide-embracing in its character, and the astonishing fact is revealed that more than twenty centuries before the Christian era the art of writing was not confined to the classes, but had been acquired by a large portion of the masses. Formerly the earliest record of letter writing was the treacherous missive sent to Joab by the hand of Uriah the Hittite, which may approximately be placed about B. C. 1000. Still there was little indication that the attainment of this power was general at this period, or in the later age of Solomon.

Some ten years ago a most important find of tablets was made by native diggers in Babylonia. The site from which they were obtained was the mound of Tel-Sifr, the site of the ancient city of Larsa—the Ellasar of Genesis xiv. This city, about B. C. 2300, was of great importance. The whole of the land had been swept by a terrible invasion of the Elamites, and, both Erech and Ur being destroyed, a temporary capital was established at Larsa. But a new power was rising, which eventually was to found forever the great Babylonian Empire. The gradual infiltration of the Arabs into Babylonia had been going on for centuries, and at last an Arab dynasty established itself in Babylonia, making Babylon its center. Gradually, by the wonderful organizing power which the Semites have always shown, they established themselves as rulers of the whole land, and in B. C. 2280 the great King Khammurabi—whom there is much reason to regard as the Amraphel of Genesis xiv.—was king paramount over all Babylonia, and claimed for himself the title of "builder of the empire."

Among the inscriptions found at Tel-Sifr are a number of letters, forty-six of which are written by Khammurabi to the petty ruler of the city of Larsa. These letters, then, carry us back more than seven centuries in the history and antiquity of letter writing. The importance of this discovery, now developed by Mr. Leonard King, is very great, as they come as contemporary and confirmatory records of this most important period in Oriental history. Written on little clay tablets about three inches long and two wide, they are certainly the oldest letters in the world. Their value is much enhanced by the fact that they belong to a period to which there is every reason to assign the date of the migration of Abram. To the subject of Biblical historical criticism they are of great importance.

On the first examination of the tablets, Mr. King was struck with the resemblance which the name copied by Scheil presented to the name of a Babylonian general mentioned in the Museum letters. A copy of the Constantinople letter being obtained by photographs, it was shown that the name of Kuderlagamar did not exist, but that of Inukh Samar, a Babylonian general, instead. It is now found that there are three tablets which form a series relating to an important war with Elam, probably late in the reign of Khammurabi. One of them refers to the capture of certain Elamite statues of goddesses, and the Babylonian king writes to his subordinate requesting them to be sent to Babylon.

In this letter we read: "To Sin-iddina thus speaks Khammurabi (the King) Zikha-ili-su, and Khammurabi-bani the Vizier in regard to the goddesses as messengers I send. As in a temple the goddesses in barks (sacred ships) cause them to ride. To Babylon may they bring them. The female bodyguard after them let them be brought. For the offerings of the goddesses let four fat rams be provided. Appoint a bodyguard. The goddesses to Babylon may they bring in safety; let them not delay. Quickly in Babylon may they arrive." The next tablet in the series is the one published by Icheil. The statues having arrived in Babylon, some evil appears to have happened, which was attributed to their anger, and so the king desires to return them to their native shrines. But this must be done in such a way as not to display weakness—and thus the king's orders are as follows:

"To Sin-iddina speaks thus Khammurabi (the King): The goddesses of Elam which are intrusted to thee, the troops under the command of Inukh-Samar will bring safely to thee, with the troops that are in thy hands attack the people (Elamites), and the goddesses to their shrines let them go in safety." It is evident that force had to be employed to restore the divinities to their shrine. The military genius of this ancient king is well shown in these letters. In one he writes that certain men who were sent guards of the great gate had not gone to their posts: "Send," he says, "and let them bring these men to them and place a guard over them, and send them to Babylon." In another letter he writes: "For the troops of Imgur Bel and under the command of Rimmanirisu. Sent teams, let them be brought, and a march make. Let them arrive in two days."—London Standard.

A Western View of Our Canals.

"Expert engineers all agree that the usefulness of the Erie Canal as a highway of commerce is practically ended," says The Detroit News-Tribune. "Traffic is falling off so rapidly that soon it will be of insignificant proportions. The State has recently thrown away $9,000,000 in work which does not afford a penny in return. The proposed expenditure of $15,000,000 more to complete a 9-foot channel is regarded as a useless waste of money, because no waterway which requires a breaking of bulk and transfer of freight from lake shipping at Buffalo can hope to compete with the railroads. On the other hand, it is the universal opinion that through traffic from the lake ports to New York by means of a ship canal will always hold its own against railroad competition. The Erie Canal, once the main avenue of travel and commerce between the East and the West, has passed its day of usefulness like the old stage coach. It has become a source of great inconvenience in the cities of Rochester, Syracuse, and other large towns. The lake route would enable the State to abandon the unused portions of the big ditch, and wherever it is in the way it could be filled up and the ground occupied for other purposes."

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A BARROW WITH TWO WHEELS.

A new form of wheelbarrow has been invented by Henry Gries, of Egg Harbor City, N. J., in which are employed two wheels arranged tandem and two pivoted supporting legs.

The body of the barrow is supported upon the usual two side beams, at the forward end of which the small wheel is journaled, and near the rear end of which a larger wheel is journaled in depending brackets. In bearings on the under faces of the side beams, at the rear of the brackets, a shaft is mounted, which extends beyond the side beams. At the extremities of the shaft supporting legs are mounted, to the free ends of which cords are secured, which are reeved through eyes on the body and side beams, and provided with rings adapted to engage with pins on the ends of the handle.

When the barrow has received its load, the cords are drawn back and attached to the side beams, thus carrying the legs out of contact with the ground, as shown by dotted lines in the illustration. When the barrow is not in motion, the cords are disconnected and the legs permitted to drop to the ground. The legs are held in their supporting position by means of removable pins passed through above the shaft. Stops on the side beams, in front of the shaft, prevent the barrow from moving forward.

A barrow thus constructed, it is claimed, will enable one to carry heavier loads with less fatigue than heretofore, because the larger rear wheel supports the entire weight. The power exerted is used merely to direct and propel.

A TWO-WHEELED BARROW.

NEW EXPRESS LOCOMOTIVE FOR THE PENNSYLVANIA RAILROAD.

The Pennsylvania Railroad Company have recently turned out from their Altoona shops three very handsome locomotives known as Class E—1, which are intended for working their fast express trains which run between Philadelphia and Atlantic City.

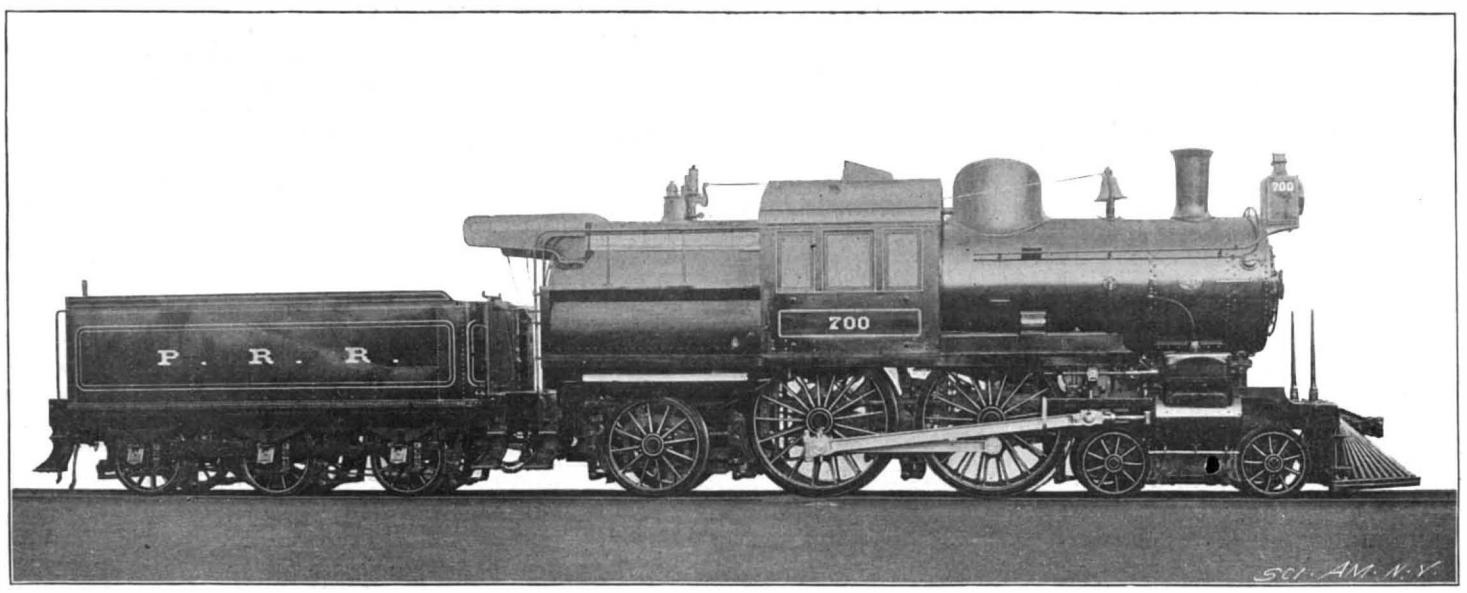
We have had occasion to refer at times to the remarkable speed which for two years past has been accomplished by the Philadelphia and Reading Railroad between these two cities, the distance from Camden to Atlantic City (55·5 miles) being covered at the rate of from 69 to 74·4 miles an hour. On these runs the speed for several miles would frequently rise to over 80 miles an hour; indeed these high speeds were of daily occurrence. The engines which hauled these trains were known as the "Atlantic" type, and were built under the Vauclain compound patents. The pair of high-pressure cylinders were 13 inches in diameter and the two low-pressure cylinders 22 inches in diameter, the common stroke being 26 inches. The drivers were 7 feet in diameter, and the total heating surface was 1,836 square feet. The train load varied from five to seven cars.

The distance from Camden to Atlantic City by the Pennsylvania Railroad is 58·3 miles, and the company have put in service recently the very powerful engine shown in our illustration, which has been making some remarkable runs which, considered as feats of heavy, high-speed express service, surpass the work which has been done on the rival line; however, as will be seen from the subjoined particulars, the Pennsylvania locomotives are considerably larger than the "Atlantic" compounds.

The class E—1 engines are of the simple type, with cylinders 20½ inches diameter by 26 inches stroke. The drivers are 6 feet 8 inches in diameter, and the pair of trailing wheels, beneath the firebox, are 56 inches in diameter. The boiler is a huge affair, with a 67-inch barrel and a 42-inch combustion chamber. There are 218 square feet of heating surface in the firebox and the total heating surface is enormous, reaching 2,320 square feet. There are three hundred and fifty-three 1¾-inch tubes, the firebox measures 104 by 96 inches, and the grate area is 69·23 square feet. The total weight is 173,450 pounds, of which 101,550 pounds is on the drivers.

While the engine is distinctly of the "Atlantic" type, there are certain features which are novel, such as the including of the sand-box and steam dome under one casing, which results in what looks like a steam dome of unusual proportions. The effect is not unpleasing, as the great size of the engine enables it to support such a large dome without destroying the generally good contour of the engine. It will be noticed, moreover, that the tender is of the English type, being carried on six wheels instead of on eight, as in the usual American practice. The rear pair, however, are equalized.

With an engine of such powerful proportions it is not surprising to learn that the Pennsylvania Railroad is hauling heavy trains at very high continuous speeds.



NEW EXPRESS ENGINE FOR THE FASTEST TRAIN IN THE WORLD.
Cylinders, 20½ by 26 inches; drivers, 6 feet 8 inches; heating surface, 2,320 square feet.

Three runs made in the latter part of last month are highly creditable and enable this particular train to take first place among the fast trains of the world. There are trains that make longer runs without a stop, as in the case of the Empire State Express in this country, and several crack expresses in England and France; but the load hauled is not so great, nor is the speed so great by from 14 to 10 miles an hour.

On July 18, 1899, this engine drew a train of seven cars, weighing 466,100 pounds, from Camden to Atlantic City, 58·3 miles, at an average speed from start to stop of 68·6 miles an hour. During this run one stretch of 25 miles was covered at the rate of 83 miles an hour.

Two days later the same engine drew a train of eight cars, weighing 538,850 pounds empty, or, including passengers, etc., 590,000, over the same run at an average speed of 66 miles an hour, 30·6 miles of the distance being made at the rate of 76·5 miles an hour.

On July 31, 1899, eight cars, weighing empty 526,650 pounds, and carrying 369 passengers, made the run at the rate of 69·3 miles an hour, and covered 30·6 miles at the average speed of 81·6 miles an hour, 24·9 miles of this distance being made at the rate of 83 miles an hour.

The Plastering of Wine.

The Lancet recently contained an encyclopædic article on sherry wine, being a report of its analytical commission. One of the most interesting points on which the writer touches is that of the so-called plastering of wine—that is, the addition of calcium sulphate to the must.

As regards sherry wine, it seems that the practice has been followed from a very remote period, since classical authors refer to it as an ancient one. It is stated that the sherry growers find that, as a rule, they do not produce a good article of sherry if they omit to resort to this addition of calcium sulphate.

The writer mentions several theories to account for the improving effect of the plastering, but the one to which he inclines is that of the decomposition it causes of the tartrates contained in the grape juice, whereby tartaric acid is set free and attacks the ethyl of a portion of the alcohol, giving rise to the production of an ether, ethyl tartrate, to which in great measure the wine owes its bouquet and its special flavor.

Much has been said in the French medical journals during the last few years on the question of the injurious effects of plastered wine, and M. Lancereaux has gone so far as to assert that cirrhosis of the liver, usually attributed to the excessive use of alcohol, is in reality the result, not of alcohol of itself, but of the potassium salts contained in plastered wine, and that it does not result from the use of spirits. The writer asserts, however, that among the workmen employed in the sherry bodegas, who drink large quantities of plastered sherry every day, cirrhosis of the liver is unknown, while, on the other hand, it is frequent among the dram drinkers of England and other countries.—N. Y. Medical Journal.

Automobile News.

A plant to employ about six hundred skilled mechanics in the manufacture of an oil motor carriage is to be built at Pittsburg. The Lanchester motor will be built.

A Western motor carriage owner is having his barn enlarged for the storage of motor carriages. He will build a pit from which the motor and mechanism of the motor carriage can be easily inspected and repaired.

The Haynes-Apperson carriage, which left Kokomo, Ind., arrived in Brooklyn on August 5. The journey was made in twenty-one days, but eleven of them were devoted to business matters. The tires were punctured twice, but there were no other accidents.

Several new publications on the automobile have already appeared or are scheduled to do so. On September 12 the first issue of The Motor Age will appear. This is a continuation of The Motor Vehicle Review of The Cycle Age. The automobile news published in The Cycle Age has been excellent and we shall be glad to welcome this section which is to be published separately and enlarged. We have already referred to The Automobile, an illustrated monthly, the first number of which will appear by October 1. Another journal called The Automobile, also published in New York city, has already appeared, and we shall notice the same as soon as the second edition of the first number has appeared. In addition there are promised The Automobile Review, Speed, and The Autobain. The last three are to be published in Chicago. The Horseless Age has been published in New York for several years and is enjoying a well-deserved popularity.

The German vs. American Pound Weight.

In compliance with a Department instruction, Consul Brodowski, under date of July 7, 1899, transmits the following explanation regarding the continued use of the pound as a weight measure in Germany and the relative values of the German and American pound:

The metric system of weights and measures was introduced into Germany shortly after the Franco-German war, but the Germans in general in their everyday dealings continue the use of the pound almost exclusively, especially older people, who in their younger days were accustomed to this expression. All my bills here for meat, groceries, etc., are made out in pounds; and a scale of the newest construction, which I purchased to verify the weights of goods delivered, indicates both kilogrammes and pounds. One kilogramme is exactly two former German pounds, and such German pound therefore equals 1·1023 American pounds. If a German firm, especially a smaller one, which cannot afford to employ an English-speaking clerk, writes its letter to the United States in German and orders its goods in pounds, meaning German pounds, and the American firm makes its estimate in American pounds, the result will be trouble and misunderstanding. It is well, therefore, for our people in their correspondence with German firms to make a note of the difference between the German and the American pound.

AN Italian statistician has computed by means of railroad returns that the foreigners who visit Italy spend annually $61,000,000 in that country.

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Pests and Their Antidotes.

BY CHARLES MINOR BLACKFORD, JR., M.D.

Throughout all of living nature, there is a ceaseless warfare going on in which each animal or plant is endeavoring to obtain advantages for itself at the expense of some other organism. From the highest to the lowest, each living being has some "bane," some enemy that seeks its destruction, and in turn it is the pursuer of some other creature to which it is a relentless foe.

This makes the "struggle for existence," and in this struggle only those forms that are peculiarly adapted for defense or concealment will escape and propagate their kind. But for this check, even the animals whose rate of increase is the lowest would overrun the earth, and become a menace to the remainder of organic beings.

For this reason it is always a dangerous thing to introduce a new animal or plant into a region in which its natural enemy may be missing. The United States has had several disastrous experiences of this sort, and all civilized countries are now on the alert to prevent them. One of the most striking illustrations of the danger is given by the history of the Gypsy Moth.

In 1868, Leopold Trouvelot, a noted scientist, was making some researches into the silk-producing organisms, and for this purpose he imported a few specimens of the Gypsy Moth (Porthetria dispar). By accident some of the moths escaped through an open window and the unfortunate student at once gave the alarm. The fugitives were carefully sought and the ground about the window was burned over in hope of destroying them. Subsequent events showed that this precaution was futile. The inhospitable climate of New England retarded the increase of the moths, but during the succeeding twenty years they gained in numbers, and in 1889 they had become a devastating army. About the towns of Medford and Malden, Mass., the worms overwhelmed everything. All plant life was threatened; trees of all sorts were stripped of their foliage, even grass was devoured. The sides of houses and fences, clothes hung out to dry, passing vehicles, everything that afforded lodgment became covered with the squirming bodies, and the air was laden with the nauseous odor of the loathsome green worms. Nothing seemed to produce any effect on them, and so grave was the menace that the State authorities had to interfere. A commission was appointed in 1890, and in March of that year $25,000 was appropriated for the purpose of exterminating the moths.

A large number of men were set to work. The worms, nests and eggs were gathered by pailfuls and burned; the trees were sprayed with Paris green, and walls were scraped to destroy eggs.

In June an additional appropriation of $25,000 was made, and the work prosecuted with the greatest vigor; but the numbers of the pest defied all efforts. In 1891 the appropriation for destroying the moths was $50,000, in 1892 it was raised to $75,000, and in 1893 and 1894, $100,000 for each year was expended; while in 1895 the State gave $150.000 on this account. In six years more than half a million was used and the infected area was but little reduced.

Of late years the Gypsy Moth Commission has had better success. The female moth is unable to fly, and so the area over which she can deposit eggs is restricted. The relentless warfare waged on them has at last produced results, and it may be said that this pest is under control. The cost of its suppression has been enormous. The direct monetary expenditure is large, and the indirect losses occasioned by these voracious creatures cannot be estimated.

An example of the unexpected results that may follow the introduction of strange inhabitants is given by the mongoose in Jamaica. The sugar mills of the island were infested with rats. Cats, as usual, proving useless, a number of mongoose were imported to destroy the rats. The mongoose rapidly accomplished this end, and, having exterminated the rats, sought other food. Birds became the victims, and the voracious intruders even learned to climb trees in pursuit of eggs and nestlings.

The mongoose is very prolific, and as the birds diminished under the increasing numbers of their new enemy, insects multiplied. Plants and animals alike suffered. The agricultural industries of the island were on the verge of destruction, and the government has had to take measures looking to the extermination of the mongoose. Nature is such a composite whole that the least interference, unless undertaken with full knowledge, may produce disastrous results.

In many of the rivers of Brazil a plant grows that is called the water hyacinth. It is very ornamental, and a few years ago a landowner on the St. John's River, in Florida, procured a small number for a pond on his estate. They increased rapidly and filled up the pond, whereupon the owner had them gathered up and thrown into the river. The experiment was unfortunate. Free from natural enemies, the hyacinths have flourished so that on many streams navigation is practically impossible. From shore to shore there spreads an impenetrable sheet of vegetation that entangles paddles, oars, or propellers, and arrests all manner of refuse that should go to the sea. From time to time bodies of this growth become detached and drift down until salt water is reached, when the plants die and are cast ashore in putrescent heaps. A natural enemy has been sought, but, as yet, no appreciable result has been accomplished. In Brazil, a small red spider lives on the hyacinths, and is said to be injurious to it. This spider has been introduced into Florida, but no effect has been perceived.

Other instances of a similar character will suggest themselves. The "Russian thistle" is a striking instance of the spread of a land pest, and the spread of the English sparrow with the alleged evils that have followed it, is another.

Failure has not met all efforts to exterminate pests, and in several cases the successes have been brilliant. Some years ago a new insect was introduced into California from Australia. It is a small insect, and soon after hatching it enjoys a brief period of freedom, during which it can move about. It moves but a few inches, however, and then settles down for life. It inserts a tube into the bark of the tree, covers itself with a waxy scale, and raises a brood.

This scale is impervious to water and protects the owner from ordinary insecticides. It is covered by fine corrugations and from this fact the insect has received the name of fluted scale. Scientifically it is the Icerya purchasi, and it grows in such numbers that an affected tree looks as though it were whitewashed.

Soon after its introduction, the fluted scale spread through the orange and lemon groves of California, and threatened them with destruction. It was known that in Australia it was not a serious pest, so an agent of the Agricultural Department was dispatched to study it in its native habitat. He discovered that a red "lady bug," the Novius cardinalis preyed on the scale and kept it in check, so he brought a number of them to this country. Only a few survived the long voyage, but those few were tended with scrupulous care, and when their numbers had increased sufficiently, they were turned loose on the infected trees. Within a short space of time the trees were cleared, and at present the scales are being reared to preserve the lady bugs in case of another outbreak. When the lady bug was first discovered, it was called the Vedalia, and one enthusiastic grower was so pleased with its performance as to name a daughter after it.

The good effects of the "Vedalia," as it is familiarly called, have not been confined to the United States. A number of acacias were brought from Australia to the Azores Islands to be used as windbreaks. On these acacias were fluted scales, and from the Azores they were carried to Portugal, where the pest soon threatened the very existence of the orange and lemon groves. The Portuguese government appealed to the United States Department of Agriculture for aid, and full reports of the results attained by the Vedalia were sent, as well as some of the insects themselves. The reports seemed so incredible that they were put down as American "brag," and of the adults and larvæ sent, no adult and only five larvæ survived. A second shipment was made on November 5, 1897, that reached Lisbon in fairly good condition on December 19. The experience of the United States was repeated, and Portugal was freed from the scale.

This shows the true mode of proceeding when dealing with injurious plants or animals, but it is one that must be entered with care. As Jamaica found with the mongoose, the remedy may be worse than the disease, and the life history of the "bane" must be known as well or better than that of the pest. It has been suggested that the European starling be introduced to reduce the English sparrow, those suggesting it claiming that the birds are natural enemies. This is not true to any great extent, as the two live together in Europe; but even granting the ability of the starling to destroy the sparrow, there is no reason to think that its attention will be confined to this one species. It is to be hoped that this experiment may not be tried, as the possibilities that may follow the naturalization of this prolific and predaceous bird are serious in the extreme.

Helen Kellar at Radcliffe College.

Miss Helen Kellar, the girl who is so remarkably afflicted and so talented, has just completed her preparations for college under the tutorship of Mr. Merton S. Keith. She went to Cambridge in June last, and took the regular examination for Radcliffe College, and it is probable that no person ever before took any examination under such strange conditions. She is blind, deaf, and dumb, and the usual means of communicating the questions to her by means of the fingers could not be done, as Miss Sullivan, the teacher who has spent her life teaching Helen Kellar, was not able to communicate with her, as she does not know Greek, Latin, or the higher mathematics. A gentleman of the Perkins Institute who never had met Helen Kellar took the examination papers as fast as they were presented, and wrote them out in the Braille characters, this system of writing being in punctured points. The questions thus transcribed by him were put in Helen's hands in the examination room in the presence of a proctor who could not communicate with her, and she wrote out her answers on the typewriter. She was also greatly handicapped by not knowing the American Braille system, as there are two systems, the English and the American, and Miss Kellar knows only the English system, so that she had to read this unfamiliar method of writing. Her Swiss watch made for the blind was also forgotten, and there was no one at hand to give her the time. She passed the examination in every subject; in advanced Greek she received a very high mark. Helen Kellar is now ready for matriculation as a student of Radcliffe College. Her passing the examinations was one of the most remarkable achievements in the history of education. The rules governing examinations were not softened in any degree because of her infirmities, and she sat in total darkness without the touch of a friendly hand, her fingers wandering over the slips printed with unfamiliar characters, and her typewriter, picking out quick and accurate responses to the questions, which were severe.

Chlorides in Sea Air.

M. Armand Gautier recently published in the Bull. Soc. Chim. some investigations which he carried on regarding the maximum quantities of chlorides contained in sea air. The experiments were made at the lighthouse of Rocheouvres, in October, 1898. The air was passed slowly by aspiration through a long tube containing glass wool previously washed and dried, so that any mass held in suspension was deposited: 341 liters of air, under a pressure of 760 to 767 millimeters, at a temperature of 16° Centigrade, were passed through this mass of glass wool, which was then taken to the laboratory and washed in a little warm water. The chlorides contained in the filter were estimated by a silver solution. A total quantity of 0·00462 gramme of chlorine was found, corresponding to 0·0076 of salt, which, by calculation, corresponds to 0·022 gramme of sodium chloride per cubic meter of air. It is believed that this quantity, together with the traces of iodine which accompany it, give sea air the tonic qualities which characterize it.

M. P. GAUTIER describes in a recent communication to the Paris Academy of Sciences the machine used for producing the large mirror which is to be used in connection with the great telescope of the Paris Exposition, which we have already illustrated and described. The grinding machine consists of a heavy cast iron frame supporting a circular table, and on it is mounted the great piece of glass which is to form the mirror. The grinding apparatus consisted of a bronze disk charged with a polishing material, usually emery, and supported by a saddle running on two slides fixed to upright portions of the frame. The adjustment was effected by means of comparators reading to 1-1000 of a millimeter. The mirror, which is completed, is said to be an excellent one.

The Current Supplement.

The current SUPPLEMENT, No. 1234, is of more than usual interest. A most valuable article on "New Researches on the Pantheon so called of Agrippa" is accompanied by superb illustrations, showing the exterior and interior, ground plans, and details of the construction. "The Flora of the Alps" is an article by Prof. Alfred W. Bennett. The series of articles which we have been publishing on "Elevators," by Mr. Charles R. Pratt, is concluded in this issue. The usual "Trade Suggestions from United States Consuls" are given, as well as the usual notes. "Germany's New Possessions in the South Sea" is accompanied by ten illustrations. "The Trans-Siberian Railroad," by Henry Michelsen, Secretary of the National Irrigation Congress, is published in full in the SUPPLEMENT and gives those of our readers who are interested in this subject an opportunity to gain more information concerning the wonderful engineering enterprise which forms the subject of our first page engravings. "The Management of Electric Vehicles," by George T. Hanchett, is a timely one, and also the article on the phaetons which were exhibited at the Automobile Club Exhibition at Paris is accompanied by eleven illustrations. "The Climate of the Hawaiian Islands" is an article by Albert B. Lyon, M.D., and "An Anglo-Saxon 'Story of the Heavens,'" by E. Walter Maunder.

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RECENTLY PATENTED INVENTIONS.

Railway-Appliances.

RAILROAD CROSSING.—DANE SCOTT, Delphos, Ohio. The purpose of this invention is to provide a railway crossing in which the pounding of the car and engine wheels at the crossing will be avoided. This is done by providing additional inside rails running parallel with the main rails and forming guideways in which are situated sliding blocks mounted on a suitable mechanism so that, as the train passes the crossing, the blocks may be raised to fill the spaces between the rails and thus provide additional bearing surface over which the treads of the wheels may roll.

RAILWAY SWITCH.—ERNEST P. NEWMAN, Stillwater, Minn. The invention consists of an automatic switch point capable of being shifted in either direction by a detent on a car striking an arm near the switch. The shifting mechanism consists of a grooved cam connected with suitable gearing. The switch point can be moved by a lever if operated manually, or it can be suitably connected and worked from a distance.

Agricultural Apparatus.

COLTER.—ARTHUR C. GAYLORD, Sandoval, Ill. The invention consists in the main in providing the colter wheel and colter fork with conical bearings, so that they can be more readily adjusted. An improved clamp for fastening the upright standard to the plow arm is also included in the patent.

COLTER CLAMP.—ARTHUR C. GAYLORD, Sandoval, Ill. This clamp consists of a circular plate provided with ears through which pass bolts that fasten it to the plow arm. The plate has a circular hole extending half way through it and having inclined, undercut edges. The base part of the clamping jaws, that hold the colter standard, is made to fit in this hole, and when the jaws are tightened around the standard, the base is automatically clamped in place in any desired position.

COTTON-SEED DROPPER.—WARREN SMITH, De Leon Springs, Fla. The dropper consists of a framework mounted on a sharp wheel for cutting the furrow, and having suitable handles attached to the seed dropping box on the rear. A small plow or track clearer is mounted in front of the furrowing wheel, and a coverer blade fills in the furrow after the seed has been dropped. The seed box has a concave bottom with a slot in it, and a drum containing pockets, which is revolved under it by means of a chain connection with the furrowing wheel, drops the seed every few feet in the ground. A rotary stirrer in the seed box keeps the seeds from getting lumpy.

MACHINE SICKLE GRINDER.—EDDIE VILAS GREEN, Topeka, Kan. This invention consists of an attachment for mowing machines whereby a sickle may be ground quickly and automatically while the machine is at work in the field. The sickle is placed in a suitable holder which is capable of moving it forward one tooth at a time by operating a lever. The grinder is set in motion by a sprocket and chain connected with a countershaft at right angles to the axle of the machine, the countershaft being turned by a bevel. The grinder wheel is given a reciprocating movement from the point to the upper edge of the teeth by means of a connection of its pivoted supports with a wheel on the countershaft.

MOWING-MACHINE SICKLE GRINDER.—EDDIE VILAS GREEN, Topeka, Kan. This arrangement is an improvement on the foregoing grinder in that, instead of a reciprocating movement being given to the grinding wheel, this movement is given to the sickle blade itself. The blade is held in a rocker frame which is connected with a wheel on the countershaft by which it is given a reciprocating movement.

SPRAYING APPARATUS.—MARION L. JOHNSON, Mears, Mich. The sprayer consists of a chamber into which the liquid is drawn by the upstroke of a piston operated by a small windlass. A valve in the bottom of the chamber causes the liquid to be retained, and another valve in the tube leading to the spraying nozzle is kept closed till the apparatus is placed near the tree to be sprayed. When this valve is opened the piston is forced downward by a powerful coiled spring, and the operator has nothing to do but to direct the spray where it is needed.

Electrical Inventions.

TELEPHONE.—HENRY F. BLACKWELL and MAUDE A. BLACKWELL, 99 East Eighty-first Street, New York, N. Y. The object of this invention is to provide a small, compact instrument that may be carried in one's pocket and attached to a fire alarm system without impairing the circuit for fire alarm purposes. The telephone is placed in a neat box that may be hung on the open door of a fire alarm box and connected by flexible wires, plugs and sockets with the circuit. The primary is contained altogether in the telephone, except that its two ends run into the receiver, where they are connected at will by a push button. One end of the secondary is connected with the line and the other end, after passing through the receiver, runs through a condenser to the ground. Although the instrument is particularly adapted for the use of the fire department, it will also be found an accurate instrument for making capacity determinations, etc., in both underground and overhead lines.

Miscellaneous Inventions.

FIREARM.—WALTER J. TURNBULL, New Orleans, La. The invention consists of a feeding device for a firearm in which a magazine or cartridge belt is employed, and the object of the inventor is to make such improvements as to enable the cartridge to be fed by the same device that operates the hammer. This device consists of a wheel with cam teeth which operates the hammer. The inner surfaces of the teeth are grooved so as to form shoulders to engage with wings formed on the cartridge carrier. The carrier is thus turned sufficiently to bring a fresh cartridge in registry with the barrel and hammer every time the trigger is pulled.

RIPPING TOOL.—WYLY R. APPLEBAY, Lowell, Ohio. The tool consists of two handles, like scissor handles, pivoted together near one end. The handles terminate in a suitable head-piece having a plow-shaped point at the bottom forward end. Just behind this point a cutter is situated in the head. The cutter has a forward downward motion, and when operated by the shear handles rips a seam very rapidly, without in any way injuring the cloth.

TYPE-SETTING MACHINE.—CHARLES J. BOTZ, Sedalia, Mo. The machine comprises the following main parts: A casing containing a series of type channels, a movable type chute or transmitter, a composing slide, and a spacing and column-forming mechanism respectively. The type channels are arranged in a semi-circle and in several tiers. They are slightly tilted backward, and the type is pushed forward and into the chute by a ratchet-and-pawl pusher operated from the keyboard. The type chute is pivoted to move horizontally. It swings around the semi-circle and into place before the proper type-channel by pressing the corresponding key. A movable arm on the chute operates the pusher, which pushes forward the line sufficiently for a single type to fall into the chute and be delivered into the composing slide, where the types are formed into lines and spaced. The spacing and column forming, if not done by hand, is accomplished by two special attachments.

SPACING ATTACHMENT FOR TYPE-WRITERS.—ROBERT J. MINER, Greenwich, Conn. The attachment, which makes the proper spaces for tabulating accounts, consists of a series of fulcrumed space controlling blocks operated by special keys. A tappet is fastened to the carriage and the latter is stopped in the proper position by the blocks engaging the tappet. The carriage is provided with a swinging rack-bar which is lifted by a lever having its other end extending under the several blocks so that it can be moved by any of them. The raising of the rack by this lever allows the carriage to move onward till stopped by the tappet engaging the proper block.

WASHING MACHINE.—EDGAR LACHANCE, Pittsburg, Kan. The machine is constructed without the employment of rollers or shafts as rubbing surfaces for the clothes. It is horseshoe-shaped in cross section, having a corrugated lid similar to a washboard that closes the top. The machine has a perforated double bottom, so that when the machine is given a rocking motion by hand aided by springs, the heated washing fluid and steam will be forced through the clothes, thoroughly cleansing them without injury to the finest or most delicate fabric.

WEIGHING ATTACHMENT FOR TRUCKS.—GEORGE L. BANKS, Colorado Springs, Col. The attachment consists of a weighing platform mounted on two horizontal cross rods which are suspended on knife edges from the truck frame. The cross-rods are connected through lever arms by a connecting rod and coiled spring, as well as by connecting rods on each side. A pointer connected with the spring rod travels over an arc scale and registers the weight. When not in use, the weighing platform is kept in normal position by cams or other devices.

VEHICLE BODY.—FREDERICK MENZER, Flint, Mich. The object of the invention is to construct a second seat for buggies or sleighs that may be folded up when not in use. The body of the carriage is made long enough to allow of sliding the regular seat backward, after removing a folding box cover which normally closes the rear end. A folding seat and back is then raised and held in place by braces.

KILN OR FURNACE.—JAMES O'CONNEL and BENJAMIN F. HILLERY, 640 West 131st Street, New York, N. Y. The invention consists of a boiler to be set in the arches of kilns or furnaces, and utilizes the steam generated to increase combustion. The boiler is an annular chamber having a steam dome and containing a circular firebox within it. The firebox is closed at the rear end by a fire wall extending upward about two-thirds of the height of the box and by a damper hinged to the back of the wall and closed from the outside by a wheel. When the damper is closed, the products of combustion are entirely shut off from the central or burning chamber of the kiln, thus enabling a person to work in this chamber even when fire is in the furnaces surrounding it. A steam spray pipe is arranged under the grate, and the spray of steam tends materially to increase combustion.

METHOD OF FORMING DIES.—HENRY F. BLACKWELL, Jr., 99 East 81st Street, New York, N. Y. In making the die, an electrotype is first made of the article to be reproduced. The intaglio of the electrotype is then filled with a supporting compound and a composite backing is formed by surrounding the electrotype with an iron cylinder and pouring in molten metal. The electrotype and supporting compound are then removed and the die is finished off in a lathe.

HEEL-RUBBER.—JOHN H. MORROW, Chicago, Ill. This invention consists of a rubber heel casing made to fit over the heel of a shoe or boot to prevent the wearer from slipping when walking on icy sidewalks. The rubber is slit in the back at the top, and the two parts are fastened together by a button and socket or other fastening device.

Designs.

CATTLE SHED.—WILLIAM HEATON, "Big Box," Allerton, Ill. The design consists of a simple shed with a long section of sloping roof running from an apex to the back side wall. The framework of the entrance end inclines outward slightly from its base, and its upper end is connected with the main roof by a short slant-roof which makes an apex with the former. Horizontal cross beams connect the back end with the front, thus forming a loft in the upper part of the shed, and the whole framework is strongly braced. A plan view of the shed shows it to be in segmental sections in the shape of a keystone, so that a number of these sections placed together will form a curved or circular shed.

ABDOMINAL BANDAGE.—DANIEL D. MCCLURE, Portland, Oregon. The bandage consists of a Y-shaped front piece fastened upon a main body portion which tapers at each end to narrow bands that pass around the waist and are fastened in front to the end of each branch of the Y. The main body portion is also tapered downward into straps that pass around the legs and are fastened to the bottom of the Y side by side.

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Bromide potassium	2	lb.
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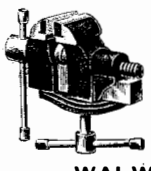

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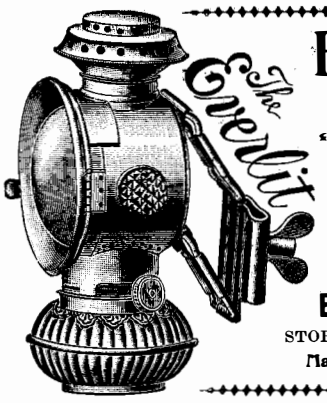

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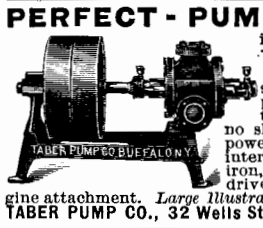

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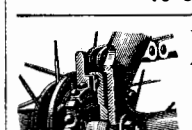

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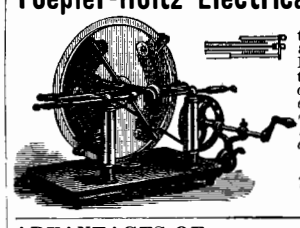

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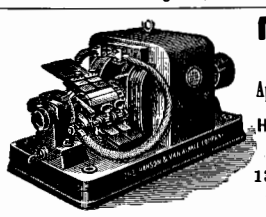

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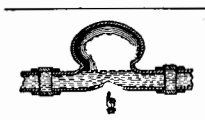

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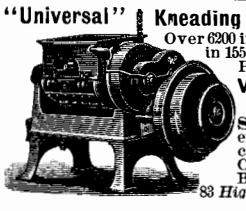

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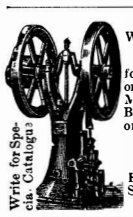

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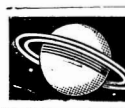

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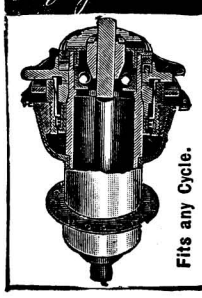

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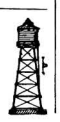

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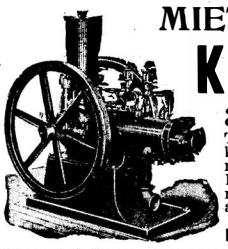

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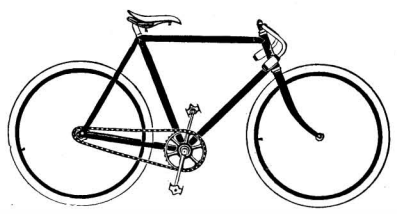

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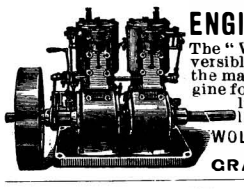

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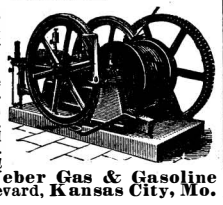

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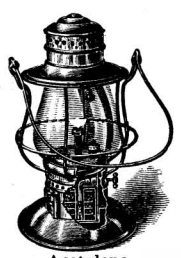

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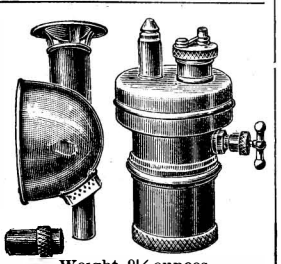

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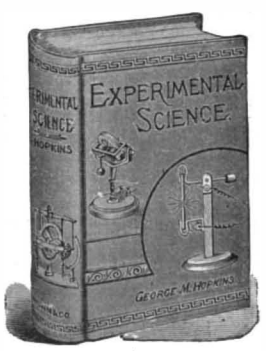

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The SCIENTIFIC AMERICAN is printed with CHAS ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York

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